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Europe/Latin America Report

SCIENCE AND TECHNOLOGY

SPECIAL NOTICE INSIDE

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SPECIAL NOTICE

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WEST EUROPE.....ivory
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USSR: SPACE BIOLOGY & AEROSPACE MEDICINE (USB)
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EUROPE/LATIN AMERICA REPORT

SCIENCE AND TECHNOLOGY

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WEST EUROPE

/9987

DANISH SCIENTISTS RESEARCH SUPERCONDUCTORS

Copenhagen BERLINGSKE TIDENDE in Danish 2 Apr 87 p 10

[Article by Jens J. Kjaergaard]

[Text] The new results are almost as exciting as H. C. Oersted's discovery of electromagnetism, physicists said after an informal meeting at the H. C. Oersted Institute.

Danish researchers are participating in a scientific race. They are able to produce materials that lose their electrical resistance at just 180 degrees below zero. Modern alchemists at the H. C. Oersted institute, Riso, and at the Danish Institute of Technology are now combining these materials in many different ways in hopes of achieving even better results than their counterparts abroad.

The goal is to produce so-called superconductors at room temperature. A psychological barrier was broken by reports from the United States last week.

We have known about superconduction for many years. We have known for a long time that electric current can flow forever if the conductor is cooled to temperatures of about minus 270 degrees. But the new research findings are almost as exciting for physicists as H. C. Oersted's discovery of electromagnetism. Our everyday life will soon be changed.

The new superconductors are combinations of copper, oxygen, and rare-earth elements such as yttrium, lanthanum, and gadolinium.

About 50 physicists and chemists talked about the enormous prospects of these discoveries at an informal discussion session. They all asked eagerly about the latest news in this field. The scientific journals can hardly keep up with events. Telephones are ringing of the hook--many transatlantic calls are being made these days.

The most unbelievable rumors are in circulation.

Chinese researchers at the H. C. Oersted Institute received an article from the PEOPLE'S DAILY of Beijing claiming that a Japanese laboratory had discovered a superconductor that could operate at 14°C. This story is repeated here third- or fourth-hand.

Extremely Precise Temperature Control

"Denmark has a good tradition in interdisciplinary scientific cooperation and we have most of the necessary equipment. Soon, however, we will need ceramic furnaces with extremely accurate temperature controls," said Professor Ib Johannsen of Chemical Laboratory II at the H. C. Oersted Institute, who convened the meeting.

Ib Johannsen recently returned from IBM in San Jose, California, to work as a "research recruit" for Professor Klaus Bechgaard, who is world-renowned for his work with synthetic metals that become superconductors at minus 260 degrees, i.e. 13 degrees above absolute zero. Cooling to this low temperature requires expensive liquid helium. The new materials are easier to use, since liquid air at minus 196 degrees is sufficient.

We may not see any practical results until 10 years from now, but we must be in the race from the very beginning. Otherwise, Denmark will be left behind, according to the researchers.

9336
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FRG MINISTER HINTS AT SOVIET, CHINESE LAUNCHER FOR TV-SAT

Bonn DIE WELT in German 10 Mar 87 p 4

[Interview with FRG Minister of Post and Telecommunications Christian Schwarz-Schilling, by Gernot Facius: "Death Sentence for the Utilization of Modern Broadcast Media"]

[Excerpts] Federal Minister of Post and Telecommunications Christian Schwarz-Schilling (CDU) fears a major setback in media technology if the minister presidents of the Laender do not reach an agreement Thursday on the allocation of channels on the first direct-beam TV satellite. Schwarz-Schilling spoke with Gernot Facius.

[Question] What sort of financial charges are anticipated for the individual users in the lead-in phase?

[Answer] We have previously stated that we need annual fees amounting to between DM 25 and 30 million per transponder in order to be able to cover operating costs for TV-Sat. However, on this point we wish to accommodate the suppliers of the programs, since this move into a new phase of satellite television is a rather major one. We want to start the fees out using the basic data of current telecommunications satellite fees--around DM 10 million--and then over the course of the years increase these fees to the basic level of 30 million, whereby we assume a certain proportionality to the number of receivers.

[Question] A few things have gone wrong technically. If more things should go wrong, do you have alternatives?

[Answer] We have firms commitments with Arianespace for the launch of TV-Sat 1. There will be no changes whatsoever in that. It can only be hoped that current indications to the effect that we can count on a launch in August 1987 are accurate, and that it will be a successful launch. Naturally, we are also looking everywhere for a reserve satellite at this time. There are interesting offers, both from the United States and from China and the USSR. We will look into all offers, in addition to the one from Arianespace, of course. If the first launch of TV-Sat 1 does not come off, these offers will naturally become much more relevant. And in that case we will take a look at all these offers, depending on the world political situation. I believe at

any rate that over the course of the years we will be seeing worldwide competitive bidding in this area. If that is the case, then price, reliability and appropriate risk coverage will be the decisive points considered in awarding contracts.

[Question] There was some concern that in the USSR, for example, the customer has little or no influence.

[Answer] From what I hear--and the USSR is currently experiencing an extraordinary boom in orders for its rockets--the Soviets are also prepared to work under the constant supervision of the owner of the satellite. In this way, the possibility of espionage can be eliminated. The world political climate, developments in the USSR and German-Soviet relations will play a significant role in this. Given present developments--in terms of what is going on between the USSR and the United States, as well as the recently initiated German-Soviet ties--it is quite conceivable that this type of deal could be finalized in 1989, if it serves German interests.

12271
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CIRCUMVENTING DANISH LAW, GENE-SPLICED RAPE PLANTED IN UK

Copenhagen BERLINGSKE AFTEN in Danish 26 Mar 87 p 1

[Article by Ojvind Kyro]

[Text] The grandiose biotechnology program is rushing forward, even though it has not been approved by parliament. The education minister has been blasted for being undemocratic and the politicians are blamed by the industry for impeding development. Now, Sukkerfabrikkerne wants to plant a test tube rape, even though parliament has not given its permission.

Biotechnologists are moving rapidly. They are making swift progress and they blame the politicians for establishing difficult laws and regulations that impede the advancement of technology.

NOVO and Nordisk Gentofte are already involved in industrial production. They have avoided having to follow every point in the new law on gene technology of June last year, because their projects were already underway at that time.

The other day a third company came onto the scene: De Danske Sukkerfabrikker. Since last summer they have been discussing a project involving the planting of a gene-spliced sugar beet, but when they applied to the authorities for permission 1 month ago, their application was not for the beet, but for a rape produced in a test tube.

An "orientation meeting on biotechnologically cultivated rape" was announced for Friday at Domus Technica across from parliament, to be followed by breakfast at Den Gyldne Fortun. A long list of important persons--that is to say politicians, officials, researchers, journalists, interest groups, and a single representative of NOAH [environmental protection group]--received invitations. They went to hear about the new yellow plant from the laboratories of Sukkerfabrikkerne.

Social Democrat Jytte Hilden, SF (Socialist People's Party) member Kjeld Rahbaek Moller, chairman of the Research Committee in parliament, and Jesper Toft of NOAH asked numerous questions after the speeches on the advantages of the rape. They received far fewer answers and after a painful silence,

which arose because there was obviously no one who wanted to waste time on any more curious questions, plant improvement chief Ib Bruun Clausen of Sukkerfabrikkerne's station in Maribo stood up and went to the podium. "The law on gene technology seems to have almost religious motivations. Do the politicians understand at all what we are talking about? Do you want to stop industrial development?" he said.

Kjeld Rahbaek Moller defended himself: "We are representatives of the people and there is widespread mistrust among the people concerning gene splicing, regardless of whether it is right or wrong."

Jytte Hilden also responded: "I reject any argument indicating that the politicians are dumb, since our work on the law was extremely thorough. I thought that we had come further than that during the 25 years in which I have been an engineer. I thought industry had learned something from the nuclear power debate, for example. I thought it was only natural that we would ask questions about what was happening behind the closed doors of the laboratories. Now all that is missing is your threats to move abroad."

Rape Linked To Beet

When the daily BORSEN hit the streets after the meeting, readers saw under the headline "Little Interest among Politicians for High Technology" that only six out of 50 invited politicians participated in Sukkerfabrikkerne's meeting and that only two of them participated actively in the debate.

But those who were absent did not miss much. "When Sukkerfabrikkerne inconveniences us with a meeting, it must be stated that the slick speeches were of no help to us politicians," Jytte Hilden said. "They did not discuss the problems and I do not want to deal with the rape question unless it is linked to the gene-spliced sugar beet."

According to the law, it is prohibited to set out plants in nature that are produced by gene splicing or cell hybridization unless a special exemption is granted. When the law was passed, the environmental affairs minister promised that parliament would be consulted before the first application for an exemption was placed on the table.

"Apparently, Sukkerfabrikkerne has intentionally taken the rape plant as the first case," Professor Ebba Lund of the Agricultural University said, "because it does not differ from the old type of plant cultivation in any way. Sukkerfabrikkerne has demonstrated clearly that there is no risk involved with this plant and, for this reason, it is not right for it to be the first plant discussed in parliament, since this could give the impression that all other cases would be similar."

BORSEN continued its campaign against the politicians the next day. This time the headline read: "Gene Technology in Danger of Choking in Regulations and Paragraphs." The article also opposed a draft version of working regulations in biotechnology laboratories. They were called "totally destructive" by Professor Soren Molin of the Technical Institute of Denmark, Prof Kjeld Marcker of Arhus University, and Knud Aunstrup, director of NOVO.

Prof Ebba Lund of the Agricultural University said she could understand the concern over the regulations in the draft, since they were far stricter than those used in the United States.

A Paradox

Although all politicians agree that biotechnology is the order of the day, the parties that are not included in the coalition government believe that Education Minister Bertel Haarder is approaching the program in the wrong manner.

Although the proposed parliamentary resolution has not come up for second reading yet, money has already been allocated for it in the budget and applications for the research and development program have already been solicited. This program involves the distribution of 0.5 billion kroner over the next 4 years.

"I have seen with astonishment that the applications have come in, even though the program has not been approved," Prof Ebba Lund said. "This is a kind of paradox."

"What Haarder is doing is undemocratic and violates parliamentary procedure," Jytte Hilden said. "Those who are submitting applications are being hoodwinked, since the fundamental principles of the program could be easily changed by the time we are through dealing with the proposal."

The government has appointed a "Biotechnology Coordinating Committee," which has called for applications. The notice sent out by this committee states nothing about the program's being subject to approval by the politicians. The committee has received a total of 48 proposals that take up 7,000 pages. They have been submitted for consideration and decisions can be made as soon as parliament approves the program.

The committee includes representatives from the two largest firms in the field, namely NOVO and Nordisk Gentofte. NOVO is involved in seven projects totaling 292 million kroner and Nordisk Gentofte is participating in three, at a cost of 153 million kroner.

The committee chairman, Professor Peder Olesen Larsen, said that they had discussed the issue of the committees competence to act. The result was that his work would be arranged in such a way as to prevent criticism. How that would occur in practice, Peder Olesen Larsen would not say, but he admitted that it could become a matter of automatic approval when the committee dealt with applications from the two firms mentioned above.

Planted In May

And what about the test tube rape? This project is moving ahead rapidly. Sukkerfabrikkerne wants to plant the rape in Lolland by 15 May at the latest. Everyone knows that this cannot be done, since this is a test case and since

the application for an exemption arrived at the mailbox of the Food Control Board only in late February. "Sukkerfabrikkerne was perfectly familiar with the procedure, so that we could have hoped to receive the application earlier," said Merete Balslev of the Food Control Board.

But the rape will be planted by May--in England. More precisely, it will be planted at the University of Nottingham, where the regulations are not as strict as the Danish law, from which an exemption must be obtained.

9336
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BRITISH ADVANCING IN BIOELECTRONICS R&D

Amsterdam COMPUTABLE in Dutch 16 Jan 87 p 15

[Unattributed article: "Disagreement on Role in Bioelectronics--British Scientists Dispute Japanese Claims"]

[Excerpts] London--British researchers dispute claims that Japan plays the leading role in the development of bioelectronics. They maintain that the UK is still the leader in the rade for the first organic computer, despite Japanese claims to the contrary.

In contrast with the Japanese situation, the development of bioelectronics in the UK is generally limited to the academic laboratories. Although even the Japanese concede that the laboratories have played an important role in the development of biosensors--and are probable still the leaders in basic research--it is doubtful whether the UK can handle further developments. It is particularly British industry in this sector that has been reaproached more than once for following the typical British path: failing to commercialize the results of innovative research.

Doubt

However, according to Christopher Lowe, director of the Centre for Biotechnology at Cambridge University, the situation is not that bleak and he considers the Japanese claims to be exaggerated. Although NEC and Fujitsu profess to be close to putting organic material on chips, Lowe and Tony Cass, lecturer in the Biotechnology department of Imperial College, believe that phase to be yet a long way off. According to Cass there remains the problem of sufficiently stabilizing the enzymes to prevent them from "dying" in an organic computer. He therefore questions the Japanese claims that they are able to replace metals in integrated circuits with proteins. Lowe nevertheless finds it disturbing that British companies cannot come up with the same amount of money and number of researchers as the Japanese. Moreover, he admits that if something is not done quickly to remedy the situation, the familiar commercialization problems could easily arise again.

According to reports, Thorn, EMI, Unilever, and Plessey are involved in advanced research on biosensors, but none of them was willing to comment on the developments to date. Christopher Lowe believes that Thron, EMI, and Unilever will soon launch products on the market. Plessey, however, will

probably wait until biosensor technology is more closely linked to information technology before putting products on the market.

According to Cass and others it will not be until far into the next century before an organic computer sees the light of day. Thus far no one has succeeded in constructing a viable organic switch, and there will not be such a switch until more is known about the organic material one intends to use.

At present, organic materials are still linked to electronics to carry out natural functions. To function as information processors, "unnatural" functions must be introduced, such as functioning as a switch. From that perspective no one has a lead, according to Cass.

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BIOTECHNOLOGY RESEARCH AT MAX PLANCK'S BAUR INSTITUTE

Milan BIOTEC in Italian May 86 pp 40-45

[A report from the Max Planck Institute for genetic improvement of plants]

[Text] The Erwin Baur Institute for genetic improvement of plants is located in Cologne, FRG, and is part of the Max-Planck Gesellschaft, a company which uses public funds to develop research programs in important scientific sectors. The Cologne Institute develops methods and material useful for improving agricultural plants, by making use of innovative technology, particularly in molecular biology. Four departments are operating in the institute (biochemistry, K. Halbrock; molecular basis for genetic improvement, J. Schell; molecular genetics, H. Saedler; genetic improvement and reproduction physiology, F. Salamini). There are about 350 employees. Recently, a research group independent of the departments was formed (in vitro cereal cultures, H. Lorz), and five other groups will be added; these latter groups have been formed in collaboration with the Institute of Genetics of the University of Cologne.

Every year the institute organizes a meeting between the researchers of the various departments and groups to discuss research projects which have yielded significant results. This article is a summary of the results and comments presented during two days of meetings on 3-4 July 1985. Although incomplete, this summary offers an idea of the themes developed and the results obtained by the Cologne institute. It is important to add that this particular institute is recognized in FRG as the national gene center for biotechnology applied to agricultural plants.

Biochemistry department

The department has been active 3 and a half years. It is interested in plant resistance to diseases; under particular scrutiny in the plant-host relationship is the plant. The studies focus on three plants and corresponding parasites:
parsley- Phytophtora megasperma
potato- Phytophtora infestans
barley- Phyncosporium secali

The following contributions were presented and discussed

D. Hauffe: Biosynthetic enzymes for phytoalexin in parsley.

The infection of parsley cells by spores of Phytophtora causes the synthesis of furan coumarin, the phytoalexin of parsley. Even the inoculation of only an elicitor extracted from the pathogen is sufficient for its formation. The synthesis of these compounds is coordinated by the appearance of specific enzymes during the metabolization of phenilpropanoids like phenylalanine ammoniolase (PAL) and 4-coumaryl:CoA ligase (4Cl). Presented are data on the purification of two other enzymes which facilitate methyl combinations in chemical compounds. Also proposed is a scheme for the accumulation of phytoalexin in the parsley plant as a response to the invasion of a pathogen which is not plant specific.

J. Bollmann: Kinetics of mRNA and protein induction in parsley cells treated with an elicitor.

The already described in vitro method for inducing the synthesis of furan coumarin was utilized to detect other proteins and messenger mRNA which are infection specific. Bidimensional electrophoresis was used for products isolated in vivo and for in vitro synthesized proteins, starting with polyadenine mRNA. Available are alpha cDNA clones obtained by differential hybridization and specific hybridization after elicitor treatment. Also available is the kinetics of accumulation of their messages, and the association of some of these clones and proteins as determined by bidimensional electrophoresis.

C. Douglas: Codifying genes for the enzyme 4-coumaryl:CoA ligase (4Cl) in parsley.

The enzyme is induced by uv treatment or by elicitor in parsley cells. The gene structure for 4Cl was studied. In parsley two are the genes responsible for the synthesis of this enzyme. Both consist of five introns and six exons; but they are different in the 3' region. The expression of the two genes is regulated in a similar way by elicitor treatment or uv light. Differences in the 5' region can be important for induction by uv or elicitor.

A. Herrmann: Codifying genes for the enzyme calcone sintase in parsley.

Two genome clones have been isolated. Both consist of two exons and one intron. Differences between the two are noticed in a 1 Kb zone in region 5'. The genetic analysis conducted on various plants by means of Southern hybridization shows that the two clones correspond to two alleles of the same locus. Both are expressed in the parsley plant.

S. Schäfer: Accumulation of mRNA in cultivated cells of parsley after uv or white light treatment.

The research is aimed at identifying the photoreceptors that receive the light stimulus responsible for the induction of mRNA. The use of red or blue light does not induce the messengers of calcone sintase and phenylalanine ammoniolase. On the other hand, the association of blue and uv light is inducive. It is concluded that uv light is essential even if differences in radiation levels are not reflected by the level of induction of messenger RNA.

P. L. Huang: Chromosome localization of parsley genes with in situ hybridization.

A technique is presented for mitosis synchronization of parsley cells cultivated in vitro and for their use of in situ hybridization on chromosomes by means of genetic probes. The technique has been evaluated by a molecular probe corresponding to a ribosome RNA gene of parsley.

B. Cuypers: Histological studies on the host-pathogen interaction between potato and Phytophtora megasperma, and Phytophtora infestans.

P. megasperma is a pathogen not specific to potato (it attacks soy beans), while P. infestans is specific to potato. The incompatible interaction with P. megasperma causes hypersensitivity interactions on the leaves (infection spots of limited size). In the compatible interaction the spot occupies the entire leaf. During the first 6 hours after the infection no differences are noted between the compatible and incompatible reactions (there is spore germination, penetration, formation of callose in the plant cells, autofluorescence, and browning). After 6 hours differences begin to show, particularly in the leaf mesophyll. An accurate description of these differences is presented.

K. H. Fritzmeier: Induction of the metabolic path of phenylpropanol compounds in potato infected with Phytophtora infestans.

The events which permit a pathogen invasion of the host tissue can be summarized as follows: penetration, recognition, signals to the nucleus of the host cell, synthesis of a transcription factor, activation of gene organizers for resistance, gene expression. To identify the resistance mechanisms, it may be advantageous to isolate the regulating regions of the genes induced by the infection. This research studies the genes which control the formation of phytoalexin in potato after infection by P. infestans (in particular, the genes which codify the enzymes PAL and 4Cl). Molecular probes are available for the two enzymes. Shown is the synthesis of their mRNA after inoculation of an elicitor (arachidonic acid). Also identified were other proteins whose synthesis is associated with the fungus infection.

J. Taylor: Gene activation for resistance in the compatible or incompatible interaction between potato and Phytophtora infestans.

Described is the isolation of at least six clones of cDNA whose messenger RNA is specifically induced in compatible interactions. Three of the six messengers are induced at a high level. The six clones are different from PAL and 4Cl.

Independent group 'In vitro cultures of cereals'.

A. Stolarz: In vitro culture of triticale.

The goal of the project is to achieve a good method for in vitro manipulation of this species. The starting material is obtained from immature embryos which generate somatic embryos in vitro. These are regenerated directly and give rise to plants with accentuated somato-cloning variation, or can generate cell cultures in suspension. A particular type of these latter cultures consists of hard,

globular type cell aggregates composed of very small cells. They generate a highly embryogenic callus and then a plant. From other triticale cultures in suspension it is possible to produce protoplast which then generates a callus but not a differentiated plant.

G. Hanhe: Embryo specific proteins from cultures of Dactilis glomerata.

A cellular suspension of Dactilis glomerata can be separated into more or less homogeneous fractions, one of which is represented by embryos. A bidimensional electrophoresis analysis of this fraction compared to undifferentiated cells reveals the presence of many specific proteins. The protein pattern depends also on the culture dilution and hormone level.

B. Junker: Transient genetic expression in cereal protoplasts.

Presented are various experiments which demonstrate the utility of expressing constructions involving specific genes in systems that do not include definite integration of DNA in the nucleus of the protoplasts utilized. The method is especially useful for the functional control of the gene promoters. It was developed for protoplasts from mais, barley, and rice using as marker the bacteria gene Neomycin phosphotransferase (NP II).

Department of molecular basis for genetic improvement

The department has been active since 1979. In the past it has been very active in the development of vectors for the transformation of plant cells. Presently, it is still studying problems of vectors, of promoters specific to tissue, of plant development and differentiation, and nitrogen take up.

K. Palme: Characterization and function of a kinase protein of Nicotiana tabacum.

In tobacco two kinase proteins have been isolated from nuclei, two from membranes, and one from cytoplasm. This last one has been purified; it has a molecular weight of 50 Kd and needs ATP, histones, and Ca^{++} to express activity. It is stimulated by lipids and inhibited by quercitrin. It phosphorizes some proteins at sites corresponding to amino acids like serine and threonine. It is active in cells in rapid proliferation. It can become a good marker for studying the cellular cycle of plants.

K. Spanier: Influence of the 6b gene of T-DNA on plant differentiation.

In plasmids of A. tumefaciens of the noctipine type the 6a gene has the function of causing the separation of opines from plant cells. The present research considers the function of the 6b gene. The gene messenger is rare; genome clones have been obtained for the purpose of creating mutants in vitro. The various constructions have been reintroduced in Agrobacterium used for infecting tobacco leaves. From these analyses it appears that the product of the 6b gene has the capability to reduce, in the absence of hormones, the production of buds. It has, in other words, a function opposite to cytokinin.

F. De Bruijn: The symbiosis between the ORS 571 bacterium and the plant Sesbania rostrata: regulation of the nif genes.

The plant Sesbania rostrata is a tropical mimosa. Some rhizobia cause the formation of nodules on the roots and on the stem of this plant. The ORS 571 strain can fix both free nitrogen and nitrogen assimilated by Sesbiana. Mutations of the bacterium, which do not fix nitrogen, have been obtained. The morphology of the nodules induced by the mutant bacteria on Sesbiana is decidedly different. Also altered is the mutant metabolism for fixing nitrogen. On the basis of the noted differences between normal and mutant bacteria it is proposed that there exists in the bacterium, in free state or in symbiosis, a regulator of nitrogen fixation.

K. Stüber: Definition of evolution trees by means of computer.

Presented is a computer program which optimizes the adaptation of experimental data to a possible evolution tree. The method is illustrated with experimental data obtained from DNA sequences.

H. H. Steinbiss: Transient expression of genes in plant protoplasts

Defined are parameters which maximize the transient expression of genetic constructions used to transform plant cells. Treatment of protoplasts with polyethylene glycol is sufficient to produce the transient expression. Linearized DNA is more efficient. At least 10^6 protoplasts are needed and at least 24 hours of incubation (tobacco). The transient expression can also be obtained by treating cut surfaces of potatoes or carrots.

C. Koncz: Methods for gene introduction and analysis of genetic expression in plants.

New genetic vectors have been constructed to transfer genes in plants, and to isolate tissue specific genes and mutants associated with morphological alterations. Using these vectors the expressions of bacterial luciferase, an endonuclease, and a methylase were obtained. Performing mutation by insertion, we observed tissue specific expressions of various promoters. The plants used were alfalfa, carrot, and Arabidopsis.

J. Schack: Translation induced by plant virus.

The virus for wheat dwarfirm (WDN) is a geminivirus; one of the two components has been cloned and sequenced. A method of infecting protoplasts of Triticum monococcum was developed, obtaining the viral inoculum from infected insects. The method allows the analysis of mutants of the WDV virus. A gene which in the virus contains the code for a protein of capsid was substituted by the NPT II gene. Activity of this gene was found in the infected protoplasts. It is now possible to obtain gene expression in plants through infection with WDV. Also reported is the transformation of tobacco with a vector containing a gene of WDV.

J. Sanchez Serrano: A codifying gene for protease inhibitor in potato.

This gene is homologous with other codifiers for protease inhibitors. It is induced in potato leaves as a result of lesions. It is, nevertheless, expressed regularly in the tuber (where it is repressed as a consequence of lesions). molecularly, it is characterized by the presence of only one intron. It was expressed in tobacco plants via transformation.

J. Stochaus: A potato gene with specificity of expression for stem and leaf.

This gene consists of five exons and four introns. It is regulated at the transcription level. It was experimentally modified in vitro (by the introduction of 450 bases in the exon near 5') and expressed in an homologous system. Plants transformed with different levels of expression have a number of copies of the modified gene proportional to the level of expression. The gene is regulated the same way as the analogous endogenous gene. When the gene is expressed in tobacco it retains tissue specificity. The construction analysis of this gene with various deletions in region 5' points out the necessity of specific sequences for the expression in specific tissues and its induction through light.

M. Steiger: Antibodies expression in plants.

The expression of genes that codify for antibody proteins H and L was obtained after their injection in the nuclei of an alga, Acetabularia mediterranea. Apparently, the assembly of a complete antibody also takes place in this alga. The same experiments repeated in tobacco indicate that the gene for the L subunit is expressed, while the gene for the H subunit is not expressed. Therefore, it is still not possible to demonstrate the assembly of a complete antibody molecule in plant cells.

D. Wing: Analysis of the region of the promoter for the gene for calcone sintase.

A construction where the gene is under the control of a weak promoter was utilized. Other sequences are sought which, when introduced before the promoter, amplify the genetic expression. A binary vector which permits the selection of these sequences was used. Demonstrated was the possibility of identifying signals with very different levels of expression.

P. Czernilofsky: Destination, expression, and recombination of transforming DNA in tobacco cells.

DNA used in experiments of plant cell transformation integrates in a stable way and is transmitted sexually. Nevertheless, sometimes it is also modified. The level of expression of the genes introduced in the plant can vary, and so can the number of genes introduced (correlation between the number and level of expression). There still are no firm data on the existence of an effect due to position; while possibly there is a modulation of the transcription level due to various physiological conditions. It is clear that before integrating in the host genome, the transforming sequences can form chains with many duplications. It is also demonstrated that, when transformed with two defective plasmids, an intact gene can be obtained through genetic conversion. The frequency of this

phenomenon can be increased by increasing the homologous regions in the two plasmids and by linearizing the DNA to be transferred. Studies of this kind illustrate the problems relative to the substitution of a plant gene with one brought by a plasmid transforming through genetic conversion.

B. Baker: Transformation and behavior of the mobile Ac element of mais in tobacco.

The Ac element of B. McClintock was inserted in tobacco through the transformation mediated by A. tumefaciens. The element is able to transpose in the new nucleus environment. A defective element like Ds, which in maize does not have autonomous capabilities of transposition, when transformed in tobacco it also does not have capabilities of transposition. It is concluded that in tobacco also, the transposition functions codified by the Ac element are sufficient to guarantee its characteristics of transposition.

G. Coupland: Genotype test for Ac transposition in tobacco.

A plasmid was constructed in which the NPT II gene for resistance to kanamycin is interrupted by the Ac element. After transformation, if the Ac element is perfectly excised, resistance to kanamycin is manifested in the transformed tobacco cell. The method was experimentally tested and can be used to verify frequencies and conditions for Ac transposition in tobacco.

Department of molecular genetics

The department was established in 1981. It concerns itself with the structure and organization of plant genes, and particularly of mobile genetic elements. These genes are also utilized to isolate other genes in which they have inserted themselves, causing unstable mutations. It does research on DNA sequences useful in constructing artificial chromosomes.

B. Deumling: Regeneration of plants from protoplasts of Scilla siberica, a monocotyledon plant.

Reported are in vitro experiments which demonstrate the feasibility of regenerating plants of this species from protoplasts. The method permits the application of transformation techniques to a monocotyledon species.

E. Walgenbach: Direct transfer of DNA in tobacco protoplasts.

The method was developed for the purpose of transferring directly large fragments of DNA in plasmids within tobacco cells. This technique should permit the isolation of DNA for the construction of artificial chromosomes. A 2 to 4 percent frequency of transformation of the surviving colonies was obtained. Apparently, there are no limits to size for the acceptance of the transforming DNA. It is also possible to obtain high co-transformation efficiencies when two plasmids are used simultaneously.

U. Weydemann: The C2 locus of maize.

This locus was cloned from unstable mutations and by using a molecular probe of a mobile element present at the locus. The gene consists of two exons and one

intron. It is now possible at this locus to study the genetic base of some alleles which induce the formation of sterile white pollen.

J. Paz.-Ares: Cloning the C1 locus of maize.

The locus was cloned using the same method described for the C2 locus. The Northern analysis shows that the gene products of the locus consist of three bands one of which is 300 bp. This small RNA is polyadenylated, it is present in multiple copies in the genome (6-8) and does not have homologies with other small RNA. The C1 gene has homologies of sequence with the C2 gene. The C-I allele, which inhibits the expression of the C allele, shows two differences: an insertion in the transcribed region and a rearrangement which extends for more than 20 Kb.

Z. Schwarz-Sommer: The A1 locus of maize.

The gene consists of four exons and three introns. In his presentation, the author illustrates in detail the existence of two wildtype alleles at this locus. One of these two alleles has an insertion in the last exon which extends into the non-translated region 3'. The allele results longer than the standard wildtype allele of DNA sequences corresponding to 14 amino acids. The extension of the gene length was caused by the insertion of a Cin4 element which possesses sequences of autonomous termination. The Cin4 element is analogous to F elements of Drosophila.

H. Cuypers: Structural organization of the En1 transposable element of maize.

The element, isolated at the genome level, contains two codifying sequences for a protein (ORF). The transcribers of the element vary in size from 1.1 to 6 Kd. The 2.5 Kd transcription is the most abundant (gene 1). It is codified by sequences pertaining to 11 exons. The first intron of the element contains the two ORF. A transcription of 1.4 Kd (gene 2) is produced starting with the same trinucleotide of the 2.5 Kd transcription. It has six exons in common with gene 1. The protein produced has a size of 43 Kd.

R. Piotrowiak: Structural organization of the Tam1 element of Anthirrinum majus.

The element Tam1 belongs to the CACTA family of trasposons to which are also associated the elements Tam2, En, and Tgm1. The length of the element is 14.675 bp and codifies by means of two transcriptions. The element structure is similar to that of En of maize (11 exons). As of now, we have not identified the proteins codified by the element. It has low homology with Tam2 and En.

R. Hehl: Interaction between Tam1 and Tam2 elements.

In strains of Anthirrinum which contain both Tam1 and Tam2 elements it is demonstrated that the transposition of Tam1 can induce excisions of Tam2. The interaction between the two elements could explain the phenomenon known as paramutation in Anthirrinum.

H. Sommer: Transposable elements can be used to study genetic structure.

The element Tam1 present in region 5' of the gene calcone sintase of Anthirrinum can generate deletions. If these deletions involve important regions of the promoter, these can be used to reveal sequences important for the transcription of the gene. The study has established that the presence of an exonucleotide (TACCAT) repeated three times in the region of the promoter in wildtype alleles is essential for sustaining high levels of transcription. If these exonucleotides are partially deleted, one observes a low level of pigmentation due to the activity of calcone sintase. Therefore this work determines the existence in region 5' of the gene, of sequences which modulate the gene transcription level.

W. Klösgen: The waxy gene of maize and potato.

In maize this gene is made up of 14 exons and 13 introns. The waxy protein has a size of 66 Kd (59 Kd when mature). In the N terminal region of the protein there is a transition peptide made up of 72 amino acids which has no homology with analogous peptides of the proteins transported in the chloroplast. In potato the waxy protein is similar to that of maize. The waxy gene of potato has 64 percent homology with that of maize.

U. Niesbach-Klösgen: Evolution of calcone sintase gene.

Eight codifying genes have been studied for the enzyme calcone sintase in eight different species of plants. Large blocks of homologies are found; for example, the first intron is always found in the same position. Some gene regions are more unique. This study allows to hypothesize that different protein domains could have evolved independently.

H. Saedler: Transposable elements and their role in the evolution of plants.

The biological significance of the presence of transposable elements in plants is discussed. In particular, the possibility is considered that duplications generated after the insertion of an element and left in situ after the excision, contribute significantly to protein evolution.

Department for genetic improvement and reproductive physiology

The department promotes activities for genetic improvement of barley, soft wheat, and potato. Also considered are other research projects concerning cloning of barley genes, physiology and molecular biology of resistance to desiccation, cytologic maps based on restrictive polymorphism in potato, and cellular genetics of potato.

J. Hesselbach: Scope and state of genetic improvement research in the department.

The various activities on genetic improvement conducted by the department are presented; described are the recent adoption of methods for the constitution of hybrids in straw cereals and methods based on recurring selection for the improvement of diploid potato. Also illustrated are selection criteria being used; these also include physiological indices.

H. Uhrig: Androgen induction of diploid clones of potato from tetraploid varieties.

The author proposes a method for extraction of diploid clones from tetraploid varieties of potato based not on parthenogenesis but on androgenesis. Diploid clones with high capability for producing androploid plants (up to 300 embryos per anther grown on a liquid substrate) have been duplicated in their chromosome number. The tetraploid clones obtained preserve their androgenic capability. In the F1 crosses of these clones the androgenic characteristic is dominant.

W. Rhode: Cloning of barley genes.

Presented is a progress report on the cloning of calcone sintase waxy genes, A1 (homologous to that of maize) and Bz1 (also homologous). These genes have been isolated by means of heterologous probes. The department interest in these genes has to do with the possibility of using them as traps for the isolation of this species of trasposons.

M. Fladung: Photosynthetic studies during leaf development in C_3, C_{3-4}, C_4 species of Panicum.

The author presents a summary of his research on the photosynthetic characteristics of three species belonging to the genus Panicum (P. bisulcatum, P. milioides, P. maximum). In particular, he discussed the correlation between photosynthetic efficiency, point of CO_2 compensation, and levels of ribulose biphosphate carboxylase and phosphoenol pyruvate carboxylase. He concludes that it is possible to reduce by about 25-30 percent the CO_2 compensation point in C_3 species by increasing the level of phosphoenol pyruvate carboxylase.

F. Salamini: Physiologic and molecular approaches to the definition of selection criteria in plans of genetic improvement.

Presented are a few recently concluded projects on the possibility of obtaining better definition of important selection criteria, for diagnostic purposes and for evaluating their relevance to production. Discussed is a physiologic and molecular approach to the problem of stress tolerance; an attempt to identify chromosome regions of the potato with genes which influence quantitative characteristics and to label these regions with polymorphic sites; an approach for better understanding plant morphology in cereals by studying mutations of development.

13120
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RESEARCHERS INTERVIEWED ON ITALIAN BIOTECHNOLOGY

Milan BIOTEC in Italian May 86 pp 21-25

[Article: "Optimists, up to what point?". Six biotechnology researchers present to BIOTEC their point of view on the future development of this field in Italy.]

[Text] It wasn't easy at the end of a stuffy summer day to involve the guests we had invited to BIOTEC main office into a discussion on re-examining the possibility of our country to finally enter, in a decisive way, the field of biotechnology.

The perspiring guests who would be commenting on the obvious but somewhat provocative question, 'how and how far will biotechnology develop in Italy?', were Giovanni Cassani, former biology professor at the university of Milan and presently director of the microbiology dept of the Lepetit Research Center; Gabriele Milanesi, professor of biology at the university of Ferrara and head of virology at the Genetics Institute of the CNR [National Center for Research] of Pavia; Romeo Roncucci, director of research of Farmitalia/Carlo Erba and of the Montedison biotechnology project, who came from the French company Sanofi the beginning of this year; Umberto Rosa, managing director of Sorin Biomedica; and Peter Schwarz, head of Enichem research and development.

Present was also Julian Davies of the Pasteur Institute and ex-president of Biogen, who had just arrived from Paris. During his permanence with Biogen, Davies had been witness to how the high hopes of that company had collided against all sorts of difficulties and had often changed into bitter delusions. Particularly for this past experience we were convinced that his presence would contribute to a realistic and concrete tone for our meeting. This was the case; although, to our surprise, as the conversation progressed, we realized that the optimists were Davies and Roncucci, the two who in the past had been associated abroad--not always with success--with the birth of biotechnology. To examine the Italian situation, we wanted to start from the two development models of greatest success --quite different from each other-- exemplified by America and Japan. What could be considered the relevant points for the American development are: a spirit of enterprise, tax regulations which favored the creation of venture capital companies, excellent state of basic research, and massive government contributions to some centers like the research laboratories of Bethesda. We estimate that with this base, more than 250 new biotechnology companies were formed from 1976 to present. The big companies, who had started late, are making up lost ground through agreements, acquisition of licences, and strengthening of their own internal research.

The different Japanese philosophy and mentality were reasons for a different start. The large chemical and pharmaceutical companies were involved first; the government became involved later, taking on the important role of coordinator for long term programs, and supporter, with massive investments, some of which were funneled to research in its own laboratories, but mostly destined to well defined programs; funds were assigned through competitive bidding to large companies who could also be associated with each other.

There are different approaches and also greater problems for biotechnology in European countries. It was, nevertheless, on Italy that we wanted to question our guests.

[Question] While abroad biotechnology was taking hold through different paths of development, how was Italy getting involved?

[Answer] J. Davies: I would like to address this from my perspective as a non Italian. Very little of you was heard outside, and this contributed to the perception that you were not particularly involved in this field. Certainly I personally at Biogen had dealings with Sorin, and therefore I'm aware that this company, since the beginnings of the 1980s has entered the field of monoclonal antibodies; I also know some small research groups the research of which I appreciate, but the judgement that can be passed in the light of what has been noticed by the international scientific community is that not much has been done in past years.

[Answer] U. Rosa: Yes, not much has been done. But examining the Italian situation of the last few years it's not hard to understand the reasons. In the past years, the two largest chemical groups in Italy, Montedison and ENI [National Hydrocarbons Agency], who are also in the pharmaceutical field, have been in big structural and financial difficulties. Only this year Montedison has shown a slightly positive balance, and it is hoped that the same will happen to ENI next year. Therefore, ENI and Montedison were not in a position to make the necessary investments in biotechnology research. Also the small and medium pharmaceutical industries did not have the strength to enter such a new sector which, besides everything else, did and does not foresee even today short term financial returns.

[Answer] G. Cassani: In my opinion, the particular situation of the Italian pharmaceutical market has also played a negative role. The Italian pharmaceutical market is, in the majority of the cases, a national market; we cannot count, like the English and the French in part, on foreign markets subject to our influence. Financial support required by biotechnology research can only be achieved by those who have the opportunity to operate on an international market.

[Answer] P. Schwarz: The recent Federchimica report on the state of biotechnology in Italy shows very well how, up to now, there has been a general levelling off in this sector. But as representative of ENI, I would like to point out that we have done something in this field. La Sclavo, the pharmaceutical company of the ENI group, has created in these recent years abiotechnology research center which is working especially on diagnostics, vaccines obtained through genetic engineering, and immunization drugs. We estimate that today more than 200 people are more or less directly involved in this program.

[Answer] R. Roncucci: Our tendency to talk only in terms of pharmaceutical products is not correct. There are other fields in which Italy possesses good technological traditions, for example, in the dairy products industry.

[Answer] G. Milanesi: Basic research in Italy is surprisingly good; there is a substratum of technical capabilities, while missing has been the function of the biotechnologist which consists in gearing these technical capabilities to the requirements of the production world. If a researcher clones a gene or prepares a vector, he limits their use to his own work, and is not able to adapt that initial result to the exigencies of production, i.e., optimization of protein production, downstream processing, etc...

[Question] Which of the procedures followed by other countries in their development of biotechnology could furnish the cue to Italy for her participation in this field?

[Answer] U. Rosa: What should be done is to eliminate immediately a possible development model guided by a long term central planning. For this to happen, one would have to go against the present process of development in the other fields of technology in Italy. Here it would be unthinkable to have a long term structural program like in Japan. On the positive side, on the other hand, I can envision successes through the innate capabilities of Italians to exploit situations and opportunities as these develop and to create winning ideas from these circumstances. Mine is not a judgement on merits, but a statement of facts. For example, in the past we have not been able to formulate our own plan for nuclear energy, and now this incapability--rightly subject of criticism--after the Chernobil disaster and the oil price drop, seems to play in our favor because it allows us to reconsider our position, something not possible anymore in other countries.

[Answer] G. Cassani: Not even something similar to what has happened in America can happen here. There, biotechnology companies were born and developed through the irresistible momentum derived from the universities and research centers. There was literally a transfer--first of discoveries and ideas, but almost immediately of people also--from the universities to the new companies, in the attempt to transform the ever more brilliant discoveries and ideas, which developed at an incessant pace, into something marketable. It was an American phenomenon tied to their research and which explains that, in reality, only in America commercial successes have been achieved.

[Answer] J. Davies: This is true but for some exceptions like the English company Celltech which, in the field of monoclonal antibodies, is surely competitive with the Americans. It is true that also in England basic research has great traditions.

[Question] Considering the late start and our peculiarities what will be our future in this field?

[Answer] U. Rosa: Italy will truly move forward when the market will show that one can start talking about profits. At that point the big companies wil work with foreign licences and the small companies will enter the field in particular, specific sectors. A little like it happened in microelectronics, where we were absent also because of lack of basic research; when the time for great development came, we developed a production capability which has captured a small portion of the Italian market. What cannot be neglected today is the development of a spirit, of a biotechnology culture which we will need later.

[Answer] G. Cassani: One can forecast that what has happened in the field of antibiotics will be repeated. As soon as the antibiotics market proved to be interesting Italy jumped in, even with original ideas, and the results have been surely positive.

[Answer] J. Davies: The first round in the international competition of biotechnologies is over without the participation of Italy, but I don't think that this is serious. We have witnessed too many groups trying to do the same things, which were, after all, very few: interferon, growth hormones...Everybody worked on these products which were judged to be of most immediate commercial value. Now, a second phase has started for which a new type of approach is needed. There is a need to find new applications, going down new trails with imagination and creativity. To do this, powerful research groups are not always needed; sufficient are a few small groups that do good basic research, and there are such groups in Italy from which industry can extract stimuli for developing application programs. For example, all the work that has come out of the colony stimulating factor was started from the work conducted by the small group of Metcalf and Stanley in Australia. These are phenomena that can also be repeated here.

[Answer] R. Roncucci: I fully agree with Davies. We are perfectly capable today of entering this second phase of development. Anyway, the general attitude in Italy will soon change. News like the recent one that Ortho Diagnostic has obtained permission from the FDA to sell the first monocloned antibodies for therapeutic use in kidney transplant cannot not influence Italian viewpoint in this field. Certainly, a few things have to change. For example, one cannot have chemists and biologists following disparate research paths without common points. The university has to perform this integration operation.

[Answer] G. Milanesi: With time the university too, in its slowness and aversity, will change. But in the meantime it is necessary that the research groups, even the small ones, be kept alive, and not be subject to a process of disintegration and associated lack of perspective for individual advancement and for the future of research programs.

[Question] Wasn't there too little and not always wise investment in basic research, the key to technological progress?

[Answer] U. Rosa: Very little was invested in research related to biotechnology, but I don't think that the situation would improve with more investments if the investment policies adopted till now continue.

[Answer] P. Schwarz: I think that the question implies uncertainty in the role of the CNR [National Center for Research] in biotechnology research. The ills of this research center of ours are well known: low paid researchers, a career not based on merit but only on seniority, a very great fragmentation of programs due to the numerous requests; under these conditions very few research centers have been able to achieve good scientific status and reach the necessary level for effective operation. All this has certainly not helped research.

[Answer] G. Milanesi: The situation of the CNR researchers is truly desperate and in these conditions it is hard to do good work. There is also another problem to resolve. Up to now, there has been too much conflict of interests between those that choose the research programs and those that benefit from these choices. I agree with Rosa that more money for research could mean only more money for the programs that are already being financed. The presence of foreign scientists--experts in this field--in the committee which chooses the programs, can only improve the selection criteria and stimulate the originality of proposals with more innovative programs.

[Answer] G. Cassani: University centers which truly operate in the sector of biotechnology are few. We of Lepetit have difficulty in finding young personnel with degree and a minimum of experience. The research doctorate could be the appropriate means for developing researchers in this field, but slots for achieving a doctorate degree are few and are utilized mostly for developing a university career or a career at the CNR. Until the universities can count on legal structures more favorable to the necessities of the industry environment it will be difficult to have a relationship of collaboration with the latter.

[Question] Would you have some concrete proposals for medium term action?

[Answer] U. Rosa: I do have a proposal. I think it would be helpful to form a consortium, or something similar, amongst Italian pharmaceutical companies, partly financed by IMI [Italian Credit Institute] (the state bank for facilitating credit in the medium term) for the creation of a biotechnology company efficiently managed, capable of rapid decision making, and productivity. This company should be able to furnish small industries those types of services which small industry cannot have by themselves.

[Answer] R. Roncucci: I think that Rosa is referring to something like the idea of Farmindustria of creating a biotechnology company to do research beneficial to those companies that cannot have direct access to biotechnological processes. It seems like a good idea which can also have the advantage of creating a cadre of specialized researchers.

[Answer] G. Cassani: Small companies which don't have strong innovative autonomy could benefit from such a center, while for large companies it could represent an excellent source of personnel with a preparation superior to the university. I don't think that the large industries would commission research, since this has to be protected by some degree of secrecy and security, which I don't think the center could provide.

[Question] What are, in general terms, the biotechnology programs of your company?

[Answer] R. Roncucci: The experience of Farmitalia/Carlo Erba in the field of antibiotics fermentation and techniques of genetic engineering have induced us to work on some of those molecules which are now of interest to all biotechnology companies. We also want to specialize in techniques of large scale purification, exploiting the possibility of having available monoclonal antibodies developed by hollow fiber technology. We will also be involved in amidation processes of peptic substances--amidation which is often necessary for guaranteeing their active state. We will start with calcitonin, which in its state of calcitonin amidase, could become a very interesting drug for treating osteoporosis of old age.

[Answer] P. Schwarz: Enichem plans to exploit opportunities in biotechnologies not only in health products but also in chemistry and agricultural products.

Regarding these last sectors we think that the development of new processes as alternatives to chemical processes for the production of high value added chemical products, new plant species with specific resistance, or new culture techniques, could all be achieved in the medium term.

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BRIEFS

TWO BIOTECHNOLOGY PROJECTS APPROVED UNDER EUREKA--Two biotechnology projects have been approved at the meeting held on 30 June in Madrid. The first, Protein Design, costing 16 MECU, was presented by the Danish companies Computer Research Int. and Carlsburg Laboratories, and received approval from Germany. The objective of the 5 year project is to prepare a complete and integrated instrumentation system and computer analysis capable of routinely resolving three-dimensional protein structures of medium size within a few weeks. Its purpose is to facilitate the design of new drugs and complex enzymes. The second project, Mass production from animal cell cultures, foresees a cost of 25.5 MECU spread over 3 years and the participation of Sorin Biomedica (3.5 MECU), Austria, and France. The objective of the project is to develop automated bioreactors for continuous process animal cell cultures of high productivity and the associated system of products extraction and purification. [Text] [Milan BIOTEC in Italian May 86 pp 60-61] 13120

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BRIEFS

PHILIPS-SIEMENS SPEAKING COMPUTER--In cooperation with the Institute for Perception Research, Philips and Siemens have developed a computer system that accepts oral commands. Until now there have been, as Philips describes them, "simple" systems on the market which possessed only a limited vocabulary. The newly developed system accepts commands in a normal everyday speech pattern. However, the restrictions inherent in communication between man and machine still exist. For one, the questions and commands must correspond to certain sentence patterns taken from 200 typical sentences. In combination with the sentences' approximately 1,000 words, a very large number of questions can in practice be asked of the system, according to Phillips. Another restriction is that to date the system is dependent on the speaker, which necessitates an individual adaptation of the system to the user's voice. The system can reply in two ways: via the monitor or by spoken word (at present only in German). The structure of the dialogue, however, does not yet permit the computer to ask a question in return, for example, a request to repeat unidentified words. Nevertheless, the system's reply makes it clear how the system interpreted the question. [Text] [Amsterdam COMPUTABLE in Dutch 30 Jan 87 p 56] 25044

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MTU OF FRG INSTALLS NEW COMPUTER-INTEGRATED MANUFACTURING SYSTEM

Munich INDUSTRIEMAGAZIN in German Mar 87 pp 152-156

[Excerpts] MTU. In its 40-year-old facilities, MTU engine manufacturers have put into operation an automated production planning and control system together with new lager logic.

Only 8 years ago, Rudolf Rueck (45), head of the labor management division at Motoren- und Turbinen-Union Friedrichshafen GmbH [MTU], was still considered "a madman." It was then that he first presented his plan for an automated materials buffer to the company management.

Today, the MTU executive is constantly delivering speeches: his transport and distribution system (TZS), which was finally put on line in 1983, has "only a few equals in Europe," Rueck says proudly.

The new computer-driven intermediate materials storage system, which conveys requested components simultaneously as needed, is--together with the FEST production control system, "reequipped" with on-line operating data recording and processing--the most important element of a central planning and control system (MTU-Cimos). It is a consistent step in the direction of the much-discussed area of computer-integrated manufacturing. FEST and TZS are complemented by a simultaneous adaptation of the production structure to make it more suitable to the flow of materials: Rueck and his men completely changed the layout of the machines in halls 10 through 16, where all of the MTU workshop production is housed.

The people in Friedrichshafen created their "factory of the future" in factory facilities that are around 40 years old. There was no possibility here of tearing down and rebuilding, since there was no room for interim production dislocation on the limited plant grounds, which are located inside the city limits.

So Rueck and his project leader, Walter Rehag (49), took on quite a job in adapting the old factory buildings to the demands of modern production and logistics, since the reorganization of the production structure, the construction of the transport and distribution system and finally the complete renovation of the facilities had to be done simultaneously and without any signficant disruption of normal operations.

The two executives were especially nervous about the construction of the extremely modern, six-million-mark rack and transport structure.

"Our task in this," Rueck says, "was to get all the materials not being processed at the moment out of the production area and to use the space freed up in this way for, say, new, modern machines," which was a reorganization effort long overdue. This is because the Friedrichshafen company, which builds 10 basic types of engines with well over 100 embodiments in small and medium-sized lot production, was wasting around 1,100 square meters of expensive production space for storing and reloading box pallets--functions that have now been taken over by TZS.

Admittedly, the new transport and distribution system is only one element in the overall MTU modernization plan. Thus, the connection of TZS to the old factory buildings and its organization integration into the MTU production planning and control system at the same time necessitates an appropriate "rearrangement" of the production structure in the factories with an optimal flow of materials. Rueck: "We have spent 6 months working on a plan for a new machine layout."

At the same time, production itself must be made more efficient. Thus, Rueck disassociated the production of "components in continually recurring quantities"--such as piston heads or bucket burners for valve lifters--from the shop assembly principle, introducing for them production islands.

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ALVEY'S DESIGN TO PRODUCT PROJECT DESCRIBED

Amsterdam COMPUTABLE in Dutch 6 Feb 87 p 20

[Article by Bob van Alphen: "Knowledge Systems Help Product Development--British Working on a 'Step-by-Step' Design Approach"; first paragraph is COMPUTABLE introduction]

[Excerpts] Some 1 billion guilders has been allocated to the so-called "large-scale demonstrator" projects, part of the Alvey program. Their purpose is to promote the transfer of research findings to the market. The "design to product" project is one example. So far the initiators are fully confident about the results.

The "design to product" project started 2 years ago. Its budget amounts to some 30 million guilders, over half of which comes from the Alvey Directorate. The goal is to have the end results ready for introduction into industry by 1990. Project Manager John Fowle of GEC Electrical Projects--one of the project's participants--is very confident. "We are on the right track. I hope we can approach the business community with concrete results within 3 years."

What is it all about, this "design to product" project? Says Fowle: "The goal is to develop complete systems, i.e., hardware and software, that meet a need. With this project we want to apply advanced technologies in combination with new software. This means that intelligent--knowledge-based--systems and man-machine interfaces are involved. Such a design support system can help any designer/manufacturer at all product development stages."

The Design Process

The system being developed is supposed to enable firms to produce their products more flexibly. Says Fowle: "It is that group of companies that needs the 'design to product' project. Adaptation to customers' requirements is extremely important for them. In fact this is daily routine in those companies. This, however, does not mean that our project is exclusively aimed at accelerating the design process. The most important factor always remains the quality of the information produced and made available to the design group. It is about time to abandon the shortsighted idea that in the future, product design will be no more than 'playing' with shapes and formulas on a screen." Much more is involved, according to Fowle.

The project includes many participants. "There are nine of us: besides GEC, there are three British universities collaborating, as well as Lucas Ltd. and the National Engineering Laboratory. Part of the software is being supplied by the universities in conjunction with the DEC Factory Automation Systems Technology Division," Fowle explains. "By 1990 we hope to be able to deliver a complete demonstration model to be applied at Lucas' Gillingham plant. This is why they are part of the team."

Two Stages of 2 and 1/2 Years

The project is divided into two phases: the pilot phase and the demonstration phase, both lasting 2 and 1/2 years. The pilot phase consists of five parts: design of a framework (design support system), generation of product data, establishemnt of a machining cell, establishment of two assembly cells, and finally, robot calibration.

Fowle continues: "By September of this year we hope to have completed phase I." The participants are now evaluating their progress and carefully planning what exactly can be demonstrated at the Lucas plant in 1990. Our system will focus on one process at the Lucas plant, namely the production of components for small diesel liquid pumps. The Lucas factory is doing all it can to obtain good results, not only to stay ahead of competition, but also to design and manufacture more efficiently.

Working Conditions

The term speaks for itself: "design to product" will be a system for both design and manufacturing processes. The core is an IKBS (Intelligent Knowledge-Based System) which in this case functions as design support system. IKBS contains a number of database routines. This database, called Design Description Document, contains various software aids to help the user design parts of particular product in an efficient way.

The system will then generate a product description providing all information needed for the product's further development, manufacture, and maintenance. In no way does this mean that the designer comes out with an idea for a new product and leaves the rest to the system. Everyone involved in the manufacturing process will have access to the design information in a form adapted to his needs. "Today, in most cases the people who need this data must also assess it and put it in a form that is useful to them. Let us take the head of the spray-paint department as an example. He must prepare for product X which the factory will manufacture within 3 months and which must be covered with a few layers of lacquer. Where does he get the necessary information? Either from his immediate superior or from the design department. Thus, others select the data he needs. This selection is now being trasferred to our system, which will provide each individual working on the new product with relevant information. This is a more objective and--we hope--also more efficient way of working," says John Fowle.

Four Areas

Exactly what information does the design support system provide? It ensures that the designer receives ready-to-use data to facilitate the preparatory work. It covers four areas: 1) functional design, 2) geometric modeling, 3) process planning and programming of numerically controlled machines, and finally 4) planning and control of the entire assembly process. The project group used the already frequently-applied Designer System of the University of Edinburgh to support the design stage. This system consists of a number of software aids obtained through artificial intelligence research. The software assists the designer in producing a functional design. It also provides access to specialized information such as manufacturing requirements; material, machinehour, and energy costs; the required technical maintenance; etc. The records of the functional design are stored in the above-mentioned Design Description Document database. In short, the Designer System allows the designer to produce rough sketches (nicknamed cartoons) even in an early stage; these will help him or her with the further conceptual design.

"The ultimate purpose of our system is to control the quantity of data."

"After a period of creative thought, designers must work toward an objective. They receive a minimum of data which still enable them to successfully develop their creation," Fowle adds.

Solid Modeler

Geometric modeling is a graphic aid which allows the designer to see his first hasty sketches in three-dimensional display at an early stage. This aid is now being integrated into the Designer System. This is done by means of a "solid modeler" called Nonane. It was developed by the University of Leeds and is already running on the current project's Sun workstations.

Before making it available to other project participants, this aid is being thoroughly tested. After some time other modeling techniques--both solid and surface systems--can also be included. The University of Loughborough is currently working on another product that will be integrated into the Designer System. It concerns a process planning package that management can use to prepare production stages. It also allows selection of aids required, such as the type of machines, special equipment (dies, etc.), the number of processing stages, special constructions for the supply of components, etc. The guideline for this selection is a basic product description, which is frequently updated. Based on this, the system generates programs for the mamufacturing of essential parts. Similar work is done for acquiring information needed for the automated assembly of the planned product. Although the state of the art is not yet as advanced in this area as in automated machining, there are so many parallels between the two activities that they may eventually be supported by common hardware.

Manufacturing System

Within the "design to product" project, actual manufacturing is handled by the "Factory Control System." This system consists of three modules: one machine control module and two assembly modules. The first one, the so-called machining cell, can be used by two production units. These units will be equipped with the most modern metal processing machines from Leslie Hartridge and Ferrantie Merlin, among others. Obviously the two assembly modules will make use of handling robots equipped with specially designed sensors to reach a high degree of accuracy during the pick and place process.

At the Lucal plant preparatory work focuses on testing assembly techniques. They have been aimed at the continuous mass production of liquid pumps. The technical experts involved consider it a challenge to bring this project to a successful end. Thus, the pilot phase lay the basis for ultimate success. The use of robots for the assembly of components is not yet common in the United Kingdom as it is in countries like Sweden, the United States, and Japan. Fowle therefore sees "his" project as a model. "If we can really show that investing in such methods will reinforce a company's market position, more companies are certain to change their tack and say farewell to their outdated methods," Fowle concludes.

Dissemination

In circles that are reluctant to invest in knowledge, people talk rather scornfully about the costly Alvey program. It is beyond dispute that the money is being well invested, but also that mistakes are being made. In any case, participants of various parts of the ambitious project have seen that the program has helped to eliminate many barriers between scientists on the one hand and application-oriented technical experts on the other. One of the positive results is certainly the start-off of a continuous exchange of ideas and knowledge among participants. The entire "design to product" project is conducted by working groups that include all kinds of people. Alongside experts in flexible production systems, ergonomics specialists also have a finger in the pie, and it is certainly no exception when a personnel officer makes nasty remarks during an evaluation discussion. He anticipates big problems in quickly training entire teams to operate small assembly robots and related equipment. Fortunately, cooperation between industry and science is apparently no hollow slogan. Both the academic world and the down-to-earth experts from industry have learned to appreciate each other's contribution. With this program the British are clearly on their way to optimize the dissemination effect of invested knowledge.

25048/12951
CSO: 3698/A151

FRG REFINES X-RAY LITHOGRAPHY FOR 16 MBIT CHIP PRODUCTION

Stuttgart BILD DER WISSENSCHAFT in German Oct 86 pp 96-111

[Excerpts] The field of microelectronics, where developments have been taking place at lightning speed, will encounter its first limitation during the coming years: the structures of chips will be smaller than the light wave of visible light and can no longer be optically discriminated. However, the properties of the tools which will make it possible to overcome this threshold are already taking shape. And this time German researchers are leading the world in this key technology: no one has mastered the art of lithography using x-rays better than a Berlin joint venture between the firms Eurosil, Siemens, Telefunken and Valvo (Phillips), as well as the Fraunhofer Society.

"About ten years ago, when we began to concern ourselves intensively with x-ray lithography, many smiled at our efforts. For several years we were, globally speaking, practically alone in this field. Because of this we were able to get a head start, even compared with the Americans who were always strongly focussed on the business at hand, or as compared with the Japanese, who evidently had underestimated this process."

Today, the Fraunhofer Institute for Microstructure Technology (IMT) in Berlin, directed by Professor Anton Heuberger, is regarded as the leading center in the world for x-ray lithography, one of the key technologies for chips of the future. At the present time, only 200-300 scientists worldwide are working in this area--for example, IBM researchers at the National Synchrotron Light Source in Brookhaven (U.S.A.) and Japanese researchers at the Photon Factory in Tsukuba. More than 120 scientists and technicians are concentrated at the IMT in Berlin at present.

X-ray lithography became such an internationally contested topic because the technology with which chips have been manufactured up until the present time will soon reach a physical barrier: in two or three years, the chip structures will be as fine as the wavelengths of visible light. At that point it will no longer be possible to further reduce them using light-dependent optical methods. X-ray lithography appears to be the tool which will make it possible to step across this threshold.

Anton Heuberger deserves credit not only for having discovered the "right track." An almost more important factor was that he was not content with

research, but rather with great impetus convinced corporations of the implications of his ideas and won their cooperation....

Heuberger thus ventured into a terrain that held two different kinds of hazards: that of scientific risk, because x-ray lithography appeared much too costly and encumbered with too much uncertainty, and that of business risk, because he sought intensive involvement with industry.

However, by now his efforts have proven their efficacy in an outstanding way. There is already talk of the "Berlin Model," meaning the cooperation between the IMT and the "Work Group for X-Ray Lithography," established by the firms Eurosil, Siemens, Telefunken and Valvo. Other forms of cooperation focussing on individual topics also exist, for example with Hoechst, as well as with mid-sized companies such as Leybold-Heraeus and Suess. And this April a new company was founded based on the Berlin model: the firm "COSY-MicroTec."...

Synchrotron radiation is of great interest for many scientific experiments--from physics to chemistry, biology and medicine. At West Germany's DESY accelerator, which enjoys an outstanding reputation internationally, experiments have been carried out practically from the beginning using synchrotron radiation as well, but only in a subordinated way, i.e. when no particle experiments happened to be in progress. However, beginning in 1980, one-third of the radiation time at the DORIS storage ring has been devoted to the "Hamburg Synchrotron Radiation Laboratory" (HASYLAB).

At the same time, construction was begun in Berlin on the BESSY storage ring (Berlin Electron Storage Ring for Synchrotron Radiation), which will be used exclusively for synchrotron radiation. Although construction costs of roughly DM 73 million were financed by the Ministry for Research and Technology, since 1982 BESSY has functioned under civil law as a limited liability close corporation (GmbH), with ownership shared by Eurosil, Siemens, Telefunken and Valvo, as well as by the two large research facilities DESY and the Hahn-Meitner Institute of the Max Planck Society and the Fraunhofer Society. It was quickly realized that from an operations perspective a cooperative form of work is much more effective.

Today, the IMT lithography laboratory at BESSY is regarded as the best-equipped laboratory in the world for x-ray lithography....

The Institute is also soon to have its own x-ray generating source: a storage ring like BESSY cannot represent the ultimate solution for the industrial production of chips, because BESSY would be much too expensive. Even in terms of physical size alone--which amounts to 300 square meters--it would be much too large. For this reason, the development of a compact storage ring (COSY--Compact Storage Ring for Synchrotron Radiation) was included in the program from the very outset. The scientific-technological development of COSY is being carried out by a team at BESSY.

This April, the partnership agreement for the firm COSY-MicroTec was signed. Chief stockholder is Leybold-Heraeus, with other shares held by the four firms that constitute the consortium. At the moment, Leybold-Heraeus still holds a

residual number of shares, which can be handed over to future interested parties.

COSY, which is to be presented in prototype to interested parties in March 1987, requires only about 30 square meters of space and will cost correspondingly less. Eight and more wafer steppers can be attached to it. The sides of the exposure fields on the wafer will measure 2-5 cm. To be sure, larger fields would be possible, but they would require that the wafer undergo only a minute degree of warping during the various process stages. Particularly in the case of high-temperature processes--such as thermal oxidation at 1200 degrees C--which can take hours, this cannot be achieved.

Initially it was hoped that the x-ray itself could be moved across the wafer, perhaps by means of swiveling x-ray mirrors or by the "wobbling" of the electron beam in the storage ring. However, the mechanical precision of the wafer stepper proved to be so great that, conversely, the wafer can be moved through the fixed beam. This is the simplest and least costly solution.

The components of x-ray lithography are thus by and large at hand. Over the coming months, IMT will make its pilot process line operational and manufacture test chips. This is not related to products for the market; the intent is merely to get a handle on the generation of structures through the use of x-ray lithography....

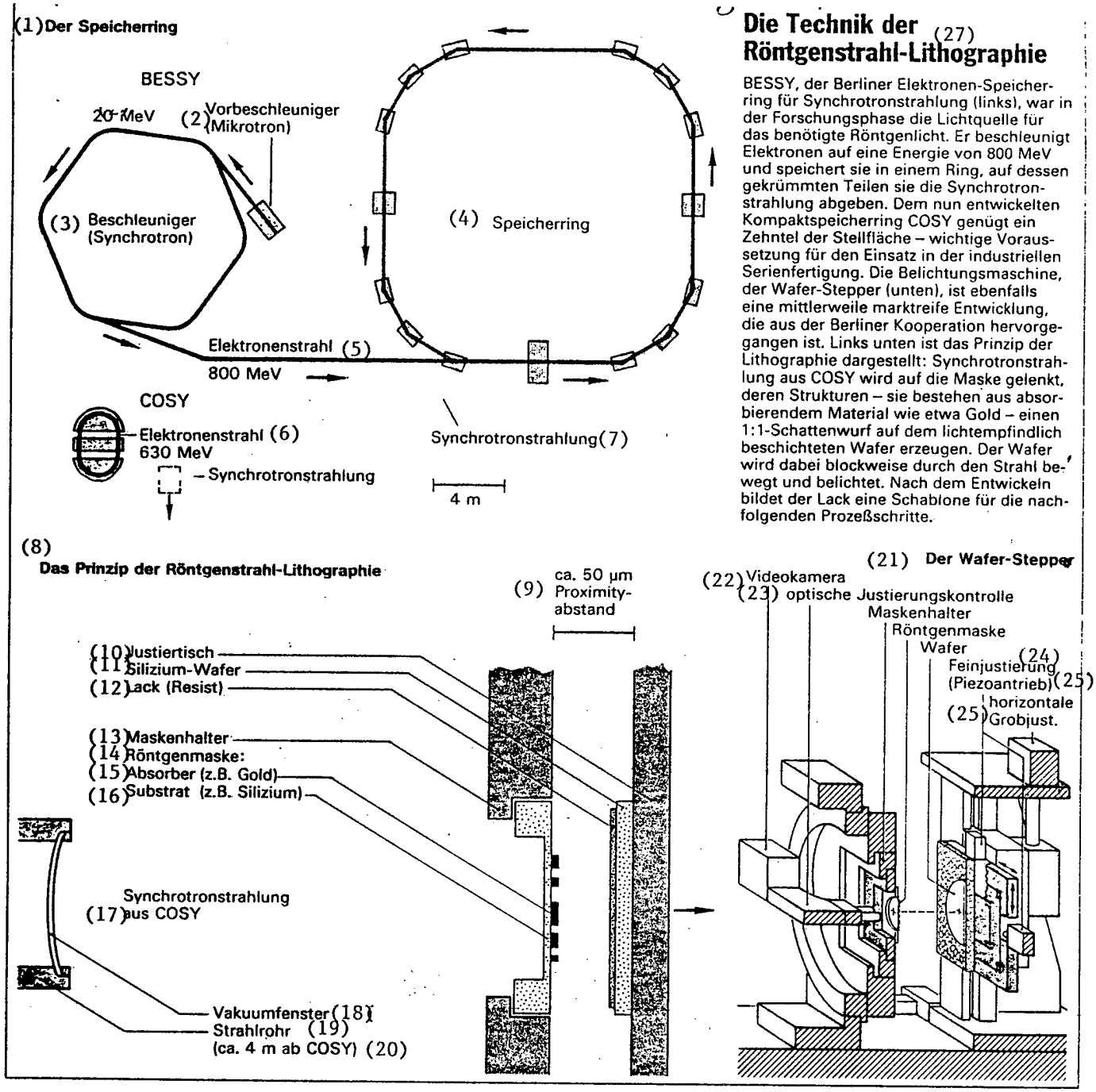
Anton Heuberger is confident: "I see indications that we will be able to assemble all the right ingredients for the chip. There are very good research groups focussing on individual questions, at the universities as well. However, additional efforts are necessary. For such a complex task, a certain number of personnel is needed, a kind of critical mass, and concentrated if at all possible in one location. Not all staff members have to be extremely creative, since many routine tasks are involved. There are basically too few of us here in Berlin."

Heuberger sees competition as coming above all from the Japanese: "As far as I am concerned, the best and largest research institute outside of the semiconductor industry is the ECL (Electro-Communication Laboratory) built by the Japanese telephone company NTT in Azugi, just outside of Tokyo. Seven hundred people are already working there, and the next stage of construction is underway. Once this stage is completed, one thousand people will be employed there."

An institute of this size, organized along the lines of the Berlin model: is this the shape of large-scale research of the future? Even the strong link to industry, which is unavoidable in order for the institute to function efficiently, is not inherent in the tradition of large-scale research in the FRG. Industrial and institutional researchers would have to cooperate directly at operations level.

Furthermore, an extreme degree of flexibility in the management of the research would be necessary. The field of x-ray lithography, for example, must be transferred within the next two years to the research and manufacturing divisions of the individual corporations. For in 1991, the 16

megabit chip is expected on the market as a possible first product of x-ray lithography.



(1) The Storage Ring
(2) Preaccelerator (Microtron)
(3) Accelerator (Synchrotron)
(14) X-Ray Mask
(15) Absorber (e.g. Gold)
(16) Substrate (e.g. Silicon)

(4)Storage Ring
(5)Electron Beam
(6)Electron Beam
(7)Synchrotron Radiation
(8)The Principle of X-Ray Lithography
(9)Distance of c. 50 micrometers
(10)Adjustment Stage
(11)Silicon Wafer
(12)Coating (Resist)
(13)Mask Retainer
(17)Synchrotron Radiation from COSY
(18)Vacuum Window
(19)Steel Pipe
(20)(c. 4 m from COSY)
(21)The Wafer Stepper
(22)Video Camera
(23)Optical Adjustment Control
(24)Fine Adjustment
(25)Piezo Drive
(26)Horizontal Coarse Adjustment
(27) X-Ray Lithography Technology

BESSY, the Berlin Electron Storage Ring for Synchrotron Radiation (left), was during the research phase the radiation source for the necessary x-ray spectrum. It accelerated electrons to an energy of 800 MeV and stored them in a ring, on the curved portions of which they give off synchrotron radiation. The COSY Compact Storage Ring which has now been developed requires only 1/10 of the surface area--an important prerequisite for implementation in industrial series production. The exposure machine of the wafer stepper (below) is also a development which has reached a stage of market readiness that emerged as a result of the Berlin Cooperation. Below left, the principle of lithography is depicted: synchrotron radiation from COSY is directed at the mask, the structures of which consist of an absorbent material such as gold and throw a 1:1 shadow zone on the light-sensitive coated wafer. The wafer is moved in blocks through the beam and exposed. After development, the coating forms a template for the subsequent process stages.

The focal point of research at IMT will therefore be clearly shifted over the next two years. The staff of approximately 40, who at present are focussing exclusively on the question of the optimal x-ray mask, will then have to address themselves to other tasks. But Anton Heuberger and his colleagues have no lack of new ideas: "Micromechanics could become a new focal point. With x-ray lithography we are able to manufacture very fine structures, which at the same time stand out in relatively high relief and therefore can carry out mechanical functions, such as those required for sensors, for example."...

At present, however, the order of the day is to take advantage of the head start of one to two years that has been achieved in the area of x-ray lithography. The devices that have been developed must also be sold, and the internal needs of the participating firms themselves are inadequate to establish demand. Heuberger: "The best wafer stepper, the best compact storage ring are of very little use to us if we are unable to market them. It is not simply a case of managerial incompetence being responsible for the difficult situation in which we find ourselves, as has often been claimed. Becoming involved in the area of high-tech carries enormous risks. Huge investments are necessary, and the European market is too small to undertake these risks alone. And selling devices in the United States and Japan requires a very professional marketing strategy. One must be represented within the country and be trusted. A client like IBM will only buy from an established house."

For this reason, criticism aimed at assistance for big industry misses--in Heuberger's view--the actual point: "Even a corporate division like Components at Siemens must depend upon government assistance where new processes are concerned which involve a preparatory phase of 10-15 years before they are ready for concrete applications. In the high-tech area, initial pushes are needed.

The examples of Suess and COSY-MicroTec also demonstrate that mid-sized businesses can show a profit in this area as well. I myself have no bone to pick with regard to government funding. The experts in the Research Ministry have supported me in a very unbureaucratic fashion. And they did that at a time when the possibility of success was very difficult to assess, which meant that each individual also took a personal risk."

Photo Captions (Photos Not Reproduced)

1. p. 96 The transistor manufactured with the help of x-ray lithography, which is shown in the large picture multiplied to the nth degree on an x-ray mask, is a result of the Berlin cooperation between business firms and the Fraunhofer Society--up to the present time for demonstration purposes only. The two views shown above taken with the scanning electron microscope show how fine and yet with what precision structures can be created using x-ray lithography: the even and relatively high ridges of coating material are less than 0.5 micrometers wide.

2. p. 98 The overlay mask (large picture) serves above all to test registration; identical registration is required in the use of several masks. But test structures are also contained, as shown, for example, in the two enlarged views on the right. The main problem with x-ray masks concerns the small differences in contrast in materials exposed to the x-ray spectrum--they are completely different from their appearance under visible light. Silicon was used here as translucent substrate and gold as absorber.

3. p. 100 The x-ray spectrum used in lithography was formerly produced by BESSY, the Berlin Electron Storage Ring for Synchrotron Radiation. Above, two steel pipes are shown which lead from BESSY to the exposure stations. In both of the lower pictures, the beam was made visible by means of a fluorescent screen. The width of the beam with low vertical extension is typical. The chamber on the left is used in order to copy masks, using x-ray lithography.

4. p. 105 COSY, the Compact Storage Ring for Synchrotron Radiation developed in Berlin, will replace BESSY as light source. Instead of 300, it requires only 30 square meters of surface area to generate x-ray radiation for lithographic processes.

5. p. 109 The steel pipe (small picture) which carries the synchrotron radiation from the storage ring to the exposure station, is evacuated, recognizable by the drawn-in window. However, the wafer stepper (large picture) works in air--clean-room air, which greatly simplifies operations. Mask and wafer are located in a vertical position slightly apart from each

other and are jointly moved by means of the synchrotron light. Unlike in the graphic (left side), the light comes from the right side in this case.

6. p. 111 The Fraunhofer Institute for Microstructural Technology (IMT) in Berlin was expanded by an additional building (on the left of the picture) after space became too tight in BESSY (right). Credit is due above all to Prof. Anton Heuberger for the fact that the Institute is regarded as leading the world in the area of x-ray lithography. Prof. Heuberger (below) recognized the importance of this technology at an early stage, and in cooperation with industrial firms he became a driving force in its development.

12792
CSO: 3698/336

FRG ACHIEVES SUPERCONDUCTIVITY AT 240 DEGREES K

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 13 Mar 87 p 7

[Text] Muenster, 12 Mar--A new "record" in the scientific race for the highest superconduction temperature--the temperature at which electrically conductive material loses all resistance to electric currents and thus becomes "superconductive"--has been achieved by Karlsruhe physicist Prof Constantin Politis. The scientist reported this in a speech before the annual meeting of the German Physics Association in Muenster. According to him, he succeeded at the end of February in developing two ceramic materials for which the "critical temperatures" for the crossover into superconduction are 125 and 240 degrees Kelvin (K), thus temperatures above the absolute zero of minus 273 degrees Celsius. The temperature of 240 degrees K corresponds to minus 33 degrees Celsius. (The adjacent article deals with the competition, which began in October and is being waged with great enthusiasm at research facilities around the world.)

The 125 and 240 K material represents the realization of one of the dreams of physics: the possibility of achieving superconductivity without resorting to the very expensive process of using liquid helium at temperatures close to absolute zero; instead, inexpensive oxygen at minus 196 degrees Celsius and even carbon dioxide (minus 80 degrees Celsius) are used. However, it appears to be quite possible, Politis said in his speech, that "the upper limit has not yet been reached" with the critical temperature of 240 degrees K. It may even be possible to push upwards into the area of room temperature. Still, even the most recent development brings with it the possibility of a revolution in electronics and electronic technology.

Politis' new superconductors are a ceramic material made of yttrium oxide, barium oxide and copper oxide. It is first pulverized; the individual components are mixed and the powder is then pressed into pellets (cylinders) that are finally transformed into an homogenous form by baking at a temperature of over 1000 degrees C. The critical factors for quality are the quantitative proportions of the individual substances in the mix, and perhaps the preparation process itself. The atom lattice structure has been resolved in the case of the first factor, but is still unknown in the second.

The theory of how the high superconductive effect in fact comes about is not yet fully understood. It is similarly unclear whether the entire material, or

rather the entire atom lattice structure, is responsible for this or whether it has to do with only certain elementary structural components. At any rate, it was only a few years ago--when metallic superconducters were the only known kinds--that it was predicted and theoretically substantiated that superconductivity above 30 degrees K (minus 243 degrees C) was not at all possible.

Politis has been working since 1965 at the Karlsruhe Nuclear Research Center (KFK); he is highly regarded in the United States, where he is also active as an honorary professor at the University of California at San Diego/La Jolla. He has worked for 10 years at the Institute for Nuclear Solid-State Physics at the KFK. He has achieved his greatest successes through working alone, with the voluntary support of enthusiastic colleagues and students. While universities and research centers throughout the world are setting up study teams in this new, extremely significant area of research, Politis must carry out his research alone. For his access to adequate lab equipment, he is indebted to the late head of the Institute for Nuclear Solid-State Physics, Prof. W. Schmatz.

12271
CSO: 3698/377

NETHERLANDS: PHILIPS/ASM JOINT VENTURE SUCCEEDS AFTER DELAY

Rotterdam NRC HANDELSBLAD in Dutch 11 Apr 87 p 17

[Article by staff writer Eefke Smit: "Philips/ASM Has Potential to Become 'Winner.' Joint Venture ASML in Veldhoven Faced Countless Problems"]

[Text] Veldhoven, 11 Apr--Three years ago when Advanced Semiconductor Materials Lithography (ASML) was founded in Veldhoven, American market analyst Ruddell immediately assessed the new joint venture as dead at birth.

In 1984 he wrote as follows in the authoritative Ruddell report about Philips and ASM's new joint venture to produce chip equipment: "Their hope of becoming one of the biggest in the world is a vain one. The world had already passed them by technologically 2 years before they got started."

This unpromising prediction paled into insignificance compared to the problems ASML later faced. In the second year of its existence the market collapsed. World sales of the chip equipment that ASML makes fell by over 50 percent with the collapse of the chip market. The next year sales dropped by half again. It was not only the established competition that found itself in difficulty. The joint venture's one parent, ASM in Bilthoven, sank slowly but surely into a serious financial crisis. In short, all the ingredients for failure were present.

But the opposite occurred. The small Veldhoven manufacturer of wafer steppers --the most advanced and complicated equipment involved in manufacturing chips, used to project the minuscule chip pattern on to a silicon wafer-- is doing extremely well. Despite the difficult times, it is beginning to show signs of being a winner. While the large American competitors which Ruddell thought ASML unlikely to catch up with are actually withdrawing from the arena, ASML is tripling its production of wafer steppers this year. This production increase is hardly braggadocio: ASML is cautiously producing only "to order."

Thus Ruddell comes to the opposite conclusion in his 1986 report. This time he writes: "We expect ASML to be very successful. Their stepper is a very advanced piece of equipment in all respects. And the new generation of equipment being developed by Philips for ASML already seems to be well received."

Planned

"So far everything has gone exactly as we planned at the beginning," says Dr G. R. Smit, general director of ASML, with satisfaction. "We had high start-up costs, 70 million guilders, but that's not a cent more than we predicted in 1984. We'll only have problems if the dollar falls further. If the dollar is stable, we'll break even over 1987 as a whole and make our first profit in the second half. We'll earn the 70 million back in a few years."

Smit recounts how fast the company has grown. In 1985 ASML shipped its first 10 wafer steppers; last year the number was 20; and this year 30 have already been sold, while there is "serious interest" in another 30. ASML's share will then have increased to almost 15 percent of the world market --estimated at 500 wafer steppers this year. Each stepper costs about $1 million.

ASML's goal of being one of the three largest wafer-stepper suppliers in the world has come "within reach," since Smit explains that the market leader, GCA, can practically be written off ("De facto it should have gone bankrupt long ago"). The most important "runners up" are in Japan: Nikon and Canon. Smaller American manufacturers have been having very serious problems for some time.

How does it happen that the established firms in this market are moaning and groaning about the hard times, while brand-new ASML is doing so well? "Our product is better and technologically more advanced," says Smit with an almost superior smile on his lips. He points out that ASML equipment can miniaturize chip patterns further than can comparable products from the competition and are more productive besides ("Hard figures prove that").

Less Stable

Smit says that the collapse of the market affected ASML much less than the competition because the company still had to acquire market share, rather than have to struggle with unsalable inventories of rapidly aging equipment. "The fact that we succeeded in winning market share in this situation is due to the quality of our product," says Smit.

Nonetheless, Smit immediately adds that two other factors played a role in this success: "In this field you've got to have a couple of things. Your technological innovation has to be structurally good. We rely on Philips' Physics Laboratory. Furthermore, you've got to have financial support from a large company. This business is expensive and you need large profits for the lean years. Our link with a multinational was important in this respect as well."

On the other hand the link with ailing ASM in Bilthoven, the other shareholder besides Philips, provides a much less stable foundation. Can partner ASM really still bear the start-up costs of the new joint venture? Smit glances out the window and says, "So far ASM has punctiliously met its payment obligations to us. ASM is in a difficult position, but those millions in losses haven't hurt us yet."

Smit laughingly rejects the rumors going around that ASM will have to withdraw from the joint venture. "It's a very small world here among the chip equipment manufacturers. All you need is one rumor and it makes the rounds from the American East Coast to the West Coast to Japan. It's just another rumor."

12593
CSO: 3698/390

FRENCH MINISTER ON GOALS, COMPETITION

Paris L'USINE NOUVELLE in French 15 Jan 87 pp 12-14

[Interview with Jacques Maisonrouge, general director of the General Directorate of Industry, by Patrick Piernaz and Alain Pauche: "The General Directorate of Industry Being Reorganized--Jacques Maisonrouge: Return to the Small- and Medium-Sized Industries"; date and place not given; first three paragraphs are L'USINE NOUVELLE introduction]

[Text] This week, 3 months after arriving at the Ministry of Industry, Jacques Maisonrouge announced the completion of a new organizational chart for the General Directorate of Industry. He has spent 3 months learning the subtleties of the directorate's operation, getting used to its slowness, and devising his plan for action.

In his interview with L'USINE NOUVELLE he reveals his wish to do everything he can to help small- and medium-sized industries (PMI) win battles in innovation and marketing by supporting their research effort and by facilitating their managers access to continuing education. This is surprising, coming from the 62-year-old, educated at the prestigious Ecole Centrale, whose only experience has been with IBM and Air Liquide....

But Jacques Maisonrouge loves to cultivate paradoxes. This man from the electronics sector makes a real plea for mechanical engineering in France and regrets the lack of interest it arouses in the major schools. What is particularly shocking to him? The fact that French companies do not prepare succession plans and let several weeks pass before replacing a top official.

L'USINE NOUVELLE: You have just announced the appointment of your two assistant directors, Gilles-Pierre Levy and Alain Perroy. They are the last two pieces in the new structure of the General Directorate of Industry. What are the tasks of these new directors, and how will you measure their effectiveness?

Jacques Maisonrouge: My task is very difficult. I am fortunate to be able to rely on remarkable men and women. I am glad Gilles-Pierre Levy and Alain Perroy are working with me.

Gilles-Pierre Levy is mainly responsible for national and international competition; Alain Perroy is in charge of the services providing the "sovereign"

tasks of the state (metrology, standardization, patents), and he is responsible for promoting industrial and technological innovation. An important task. Indeed, although many companies, particularly PMI's, could potentially benefit from technology transfers, they are not always capable of integrating them. The result is that many French inventions, even patented here, do not find national companies to implement them. This has to stop.

Of course, their performance will be difficult to measure. However, I would like to set goals for each of them. For instance, we could measure the success of certain technology transfers or the evolution of research tax credits. These totaled Fr 1 billion in 1986, and more than 2,000 companies benefited from them. Every favorable change in these figures means more researchers are being hired, as well as technicians to support them. Industrial R&D effort will also increase, particularly through more R&D contracts with national laboratories, universities, and the major state schools for higher education.

[Question] The suppression of the major industrial directorates (DIMME, DIELI, DICTD, ...) clearly leaves a huge gap. What does this change mean, and what benefits do you expect?

[Answer] Please reassure manufacturers: Most of their contacts are still in place. No revolution has taken place, only a major reorientation. We do not want to lose our specialists who are experts in their fields and who are so highly thought of by companies and professional associations that many of them have left government positions to "seek their fortune" in the private sector. In my opinion, this constitutes a problem.

What is their new task? More thorough investigation of what is going on abroad in order to make everybody understand that we are competitors on an international scale. I expect them to fulfill their technology watch function to the best of their abilities. Their expertise is good on the French level; we have to improve it on an international level and focus not on products but on markets. Here, too, we can be of great help to PMI's and will work closely with professional organizations and chambers of commerce and industry.

[Question] Do you see Japan's MITI as a model?

[Answer] I have had no recent contact with MITI, but there is no doubt that its role as an observer and a user of collected information remains very effective. You should know that all Japanese industrial managers traveling abroad have to write several reports on their return: routine reports about their visits to companies in their sector but also reports about things that surprised them during their trip. Without copying our economic partners, we would like to strengthen our technology watch function in order to provide extensive assistance to PMI's, which do not always have the human and financial resources to inform themselves about the international situation.

[Question] Is this why the ministry has been nicknamed the "Grenelle Consulting Group?"

[Answer] This expression symbolizes the ministry's new attitude. It should not be taken literally. The General Directorate of Industry does not intend to compete with consulting agencies. However, we can advise companies on the choice and the evaluation of their consultants. In particular, we can convince them that they should always be "modest" enough to ask the advice of others.

We also have a major role to play in providing training to PMI's. We should encourage use of training centers, not only by managers, but also by heads of PMI's. We always try to take training where it is needed, relying on regional engineering and business schools.

What is our goal? We would like to improve the technological and commercial level of industry. The Regional Funds for Consulting Assistance (FRAC) has been created for this purpose. Their success is obvious: It is the best publicity for the slogan "More funds for the FRAC's."

[Question] The sectorial plans have been criticized for their ineffectiveness. What do you intend to do to avoid the collapse of whole sections of French industry?

[Answer] I will not dwell on the ineffectiveness of those plans. It is clear that the solution lies elsewhere. Difficulties in certain industrial sectors are often the result of inadequate and delayed investment. The reason? Low profits. Helping industry means, first of all, letting it restore its profit margins by improving the fiscal and legislative environment and by replacing subsidies with tax incentives. Next, research should be encouraged and management methods should continue to be improved: International competition is won by innovation and product quality.

There is a third important point. Even in declining sectors, some companies do very well. They can be found in metalworking, in iron and steel, etc. I have asked for a report on these models in each sector, and I am convinced that the analysis of their success will be very beneficial. I know from experience that the success of others should be a source of inspiration. One should not indulge in cold "arrogance."

[Question] Yet, do you think certain sectors have strategic importance?

[Answer] I am absolutely convinced of it. It would be dangerous to abandon our industrial capacities in certain areas, such as armament and energy. However, I am less convinced of the strategic character of shipbuilding. Of course, we should be sure to keep good "architects" and retain the ability to build ships for the national fleet.

What really worries me most is the state of mechanical engineering in France and the lack of interest this discipline arouses in young engineers, particularly in the major state schools, including the Ecole Centrale, which I know well. Nowadays, when people talk about "high-tech," they think of electronics and data processing; the word robotics sometimes evokes artificial intelligence; it is often forgotten that the most difficult part of robotics is high precision mechanics.

At the same time I am determined to increase the use of electronic components in products made in France. Japanese and German products are estimated to contain an average of 30 percent more electronic components than French goods. We really must close this gap.

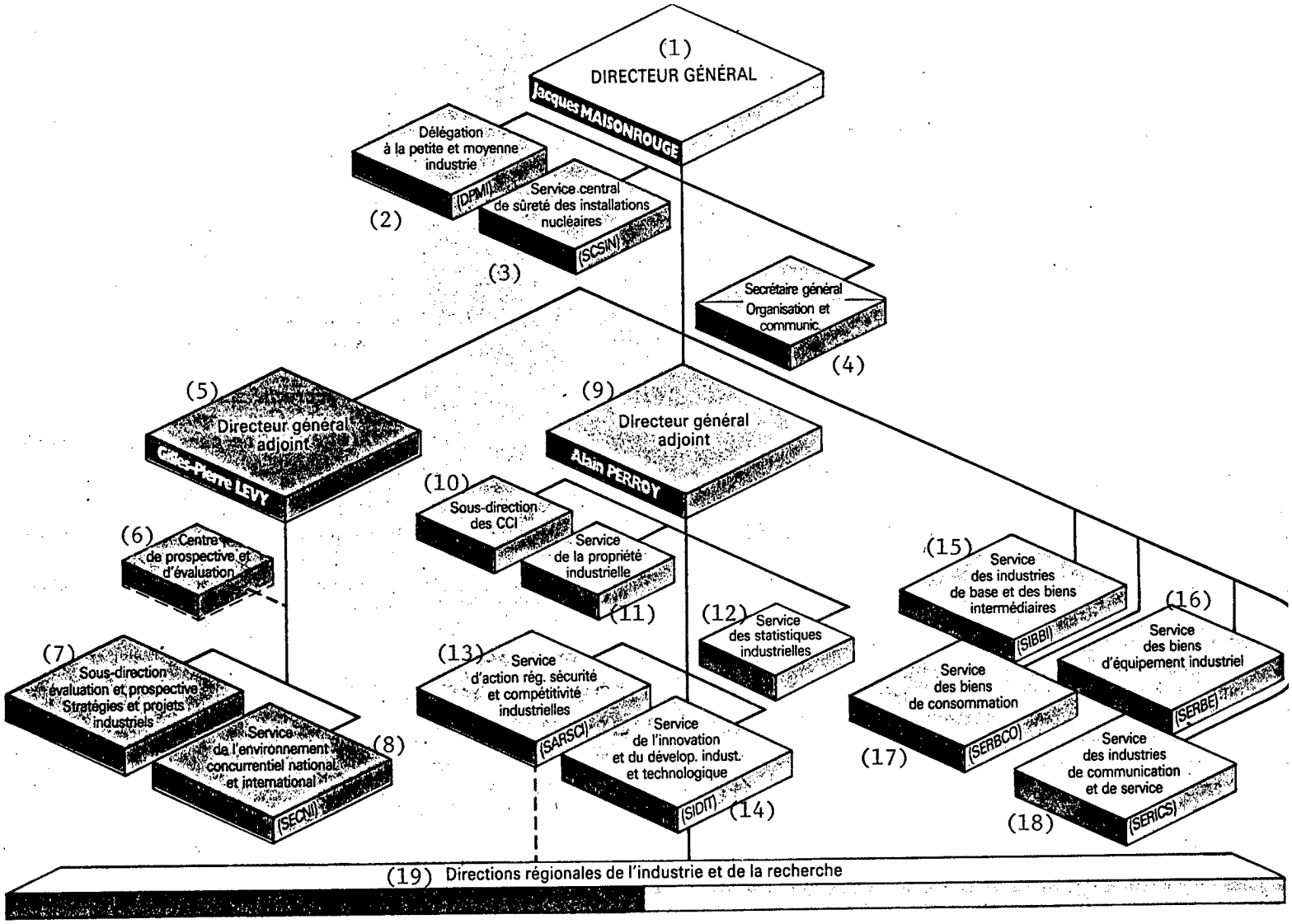
[Question] The difficulty in choosing a successor to Georges Besse at the helm of Renault was surprising. In fact, it nearly provoked a diplomatic minicrisis with Belgium. Large international companies attach great importance to preparing successors. Do you think steps should be taken in this direction?

[Answer] I am absolutely shocked to see that many French companies, even some of the largest, do not have a systematic plan for succession to the different positions in the hierarchy. Until 3 months ago I believed they had one. But I now find that there is a lack of forethought in human resources management. In the two private companies for which I have worked, IBM and Air Liquide, and in the two French companies of which I have been trustee, Moet-Hennessy and Lyonnaise des Eaux, I always managed to convince or to support managers in their decisions to institute employee evaluation reports, career development plans, and succession plans. This has to be done in large, medium-sized, and even small companies.

A large company such as Renault should have succession tables revised each year, and it should identify three or four potential successors for each important position. I am not thinking only of the chief executive officer: This has to apply to positions on at least the three following hierarchical levels.

Such a mechanism requires that managerial staff be prepared to assume new functions by having them circulate within the company and extending their horizons: They may, for instance, go from marketing to finance, from production to engineering, etc. Then, if a CEO disappears for any reason, be it retirement or tragic circumstances, such as the passing of Georges Besse, his successor should be found within 3 days.

What is valid for Renault is even more true for PMI's. How many bankruptcies or difficult company recoveries can be explained by a lack of preparation and succession of the owner/founder.... Making managers understand that they have to assure the continuity of management by surrounding themselves with senior executives is one of our tasks and constitutes one of the priorities of our training plans.



General Directorate of Industry Analyzing Markets and Serving Industry

Key [to General Directorate of Industry Analyzing Markets and Serving Industry]

1. General Director: Jacques Maisonrouge
2. Delegation to PNI's (DPMI)
3. Central Service for the Safety of Nuclear Installations (SCSIN)
4. General Secretary--Organization and Communications
5. Assistant General Manager: Gilles-Pierre Levy
6. Prospects and Evaluation Center [CPE]
7. Subordinate Office for Evaluation and Prospects--Strategies and Industrial Projects
8. Service for National and International Competitive Environments (SECNI)
9. Assistant General Manager: Alain Perroy
10. Subordinate Office for the CCI's [Chamber of Commerce and Industry]
11. Patent Office
12. Service for Industrial Statistics
13. Service for Regional Activities in Industrial Security and Competitiveness (SARSCI)
14. Service for Industrial and Technological Innovation and Development (SIDIT)
15. Service for Basic and Intermediate Goods Industries (SIBBI)
16. Service for Industrial Capital Goods (SERBE)
17. Service for Consumer Goods (SERBCO)
18. Service for Communication and Service Industries (SERICS)
19. Regional Directorates for Industry and Research

Eighteen key positions, three of which have already been filled. Four probable appointments: Marcel Vallier to the office for the CCI's, Michel Dolle (industrial statistics), Francois Cantegreil (DPMI), Michel Laverie (SCSIN).

ANVAR'S 1986 OPERATIONS, 1987 PLANS OVERVIEWED

Paris ZERO UN INFORMATIQUE in French 2 Feb 87 p 80

[Article signed D.K.: "ANVAR Concentrates on Small- and Medium-Sized Manufacturers"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Text] Last week, Christian Marbach, president of ANVAR, presented the results of the agency's 1986 aid programs for innovation as well as the outlook for 1987.

At a time when the Ministry of Industry is discontinuing certain public aid organizations, ANVAR (National Agency for the Implementation of Research) undoubtedly feels threatened, and Christian Marbach, its president, is making a special effort to demonstrate the importance of his agency's operations: "In all developed countries industrial research benefits from direct or indirect government funding, and suppressing aid to innovation would penalize our companies." Nonetheless, although it retains its role in 1987, ANVAR's resources are still being sharply reduced since the 1987 budget grant for "program authorization" (PA) is only Fr 566.5 million, i.e., down approximately 4 percent from 1986...and nearly 40 percent from 1985. With repayment of some earlier aid disbursements and the renewal of certain PA's its commitments total approximately Fr 840 million--compared to Fr 942.3 million in 1986 and Fr 1,112.6 million in 1985.

In short, times are hard, and ANVAR must limit the number of its operations. Thus, it has decided to concentrate its efforts on small innovative companies: "A drastic drop in funds for large companies and a distinct turn to small- and medium-sized firms." Consequently, despite a reduction in the total budget, aid to companies with fewer than 500 employees will increase by more than 10 percent in 1987 (Fr 700 million, compared Fr 634 in 1986). More than 3,000 small- and medium-sized industries should benefit from this aid.

ANVAR has just signed an agreement with the CGPME [General Confederation of Small- and Medium-Sized Companies] to "establish a department within the confederation to provide information and advice to small- and medium-sized companies and help them manage research and technology, develop regional promotion of innovation, and implement the French-American Facet program" which facilitates cooperation between French and American small- and medium-sized companies.

Because ANVAR has less money to distribute, it wants to change its image and henceforth be considered as a sort of advice bureau in "innovative project development" rather than as a public money-lender. Moreover, since the FIM (Industrial Modernization Fund), created 3 years ago by Laurent Fabius, has been discontinued, other ways to finance the development of innovative small- and medium sized companies had to be found: Contacts undertaken with the AFB (French Banking Association) make it possible to foresee "a sort of framework agreement whereby the agency would contribute its technical evaluation and financial aid to the development of the product and to preliminary marketing studies." In so doing, ANVAR would give projects it considers worthwhile a kind of moral guarantee which would facilitate bank approval of funding requests. Certain specific agreements of this kind have already been signed, i.e., with Credit Lyonnais and the Societe Lyonnaise de Banque. For the data processing field in particular, ANVAR has taken over certain functions previously handled by the defunct ADI, for example, with regard to software packages. "The benefiting firms will be independent companies with fewer than 500 employees, able to design, develop, and market software for professional or non-professional use." We should note that "basic software is not covered by this support." For this activity, ANVAR has a rather weak budget of some Fr 20 million.

Table 1. Amounts of Grants, Commitments, and Disbursements

Year	Program authorization grants (million francs)	Total commitments(1) (million francs)	Commitments to small- and medium-sized companies(500) (million francs)	Disbursements (million francs)
1980	726.4	548.2	323.0	
1981	479.1	659.5	396.8	
1982	640.0	632.0	397.0	22.8
1983	813.0	830.1	466.7	59.3
1984	678.7	866.8	578.5	108.6
1985	906.3	1112.6	665.7	154.3
1986	587.3	942.3	634.0	243.0
1987	566.5	840.0 (2)	700.0 (2)	250.0 (3)

(1) Total commitments = grants + disbursements + renewed program authorizations.
(2) Forecasts (excluding possible renewals of program authorizations, but including the specific grant for the data processing sector).
(3) Minimum forecasts.

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CSO: 3698/A150

STOCKHOLM EUREKA MEETING APPROVES NEW PROJECTS, FUNDING

Paris LE MONDE in French 19 Dec 86 p 31

[Article by Philippe Lemaitre: "The Little Steps of Technological Europe--Eureka Finds Its Optimal Speed"]

[Text] Stockholm--One step forward, one step back; the Europe of technology remains fragile. For their fourth meeting, the partners in the Eureka program approved 37 new research projects. The total now exceeds 100. However, the essential question of financing has still not been completely settled. Very often governments allocate credits to Eureka by taking them away somewhere else.

The financing problem has become a major one for projects originating within the EEC, such as Esprit. The 1987-1991 framework program of 7.7 billion European Currency Units has little chance of being approved by the ministers of the Twelve. European manufacturers, now unanimous in touting the merits of community projects, are concerned about seeing budgetary austerity slow their efforts in key sectors where Europe remains far behind Japan and the United States.

The expansion of Eureka, the European program of technological cooperation launched in April 1985 at the initiative of Francois Mitterrand, has been confirmed. Thirty-seven new projects involving firms from the 19 participating countries were recorded at the ministerial conference, the fourth of its type, that took place on Wednesday, 17 December, in Stockholm. The 100-project mark was crossed. French firms are involved in 62 projects (including 12 of the 37 decided on in Stockholm). The French share, which was dominant at the outset of Erueka, is stabilizing, testifying to the growing interest of the other partners.

Investments allocated to strengthening the competitiveness of European industry are on the order of Fr25 billion.

"The last born of the European ideas is showing evidence of good health," noted Mr Ingmar Carlson, the Swedish prime minister, in his opening address. Mr Carlson laid heavy emphasis on the attachment of his country, and of its partners in the EFTA (European Free Trade Association), to European design and engineering.

For those nations, Eureka and the efforts at setting up, by 1992, a large market without borders (with which they would like to be associated) provide an opportunity to tighten still further the links that have been established with the Community.

Eureka's start-up phase is not yet over, but the support of manufacturers seems assured. This success, combined with efforts at organization and explanation, probably make it possible to resolve the doubts and difficulties that could still be observed a year ago at the interministerial conference in Hanover.

On the French side, the field is clear. This was not always the case, if one remembers the criticisms levelled at the Elysee's proposals by members of the present majority (including, in these pages, Mr Andre Giraud).

Mr Chirac's administration has understood that it would be absurd not to ensure the continuity of an effort that has been well received by partner countries. Appropriations on the order of Fr350 million were made in 1986 to Eureka projects. In 1987, the subsidies will be between Fr540 million and 580 million, and it believed that when the program levels off, the government's financial contributions should be around Fr900 million per year.

A Reassured EEC

The 19, which all face budgetary problems, would like as much as possible to develop private financing for Eureka projects, not only from the manufacturers involved, but also from the banking system. The ministers greeted favorably an initiative from the Deutsche Bank to convene a January "financial round table" for the purpose of mobilizing private venture capital to benefit European technological cooperation. The Community might facilitate such moves by offering the banks at least a partial guarantee.

The problems of overlapping rivalries between Eureka and the Community are lessening. The division of tasks has become more or less clear; the Community will finance precompetitive research programs (with the further intention of increasing the involvement of the EFTA countries). Meanwhile, Eureka's goal will be to promote market-oriented projects.

"If Eureka did not exist, it would be necessary to invent it," declared Mr Karl Heinz Narjes, vice president of the committee responsible for industrial affairs, with something less than total conviction. The development of Eureka projects should create great pressures toward accelerating the opening of borders, and for setting and implementing European standards.

The committee should be pleased with its work. With respect to standards, community prodedures exist that involve the national authorities, the

Commission, and specialized bodies such as the CEN-CENELEC (European Standardization Committee-European Committee for Standardization in Electrotechnology) and CEPT (European Conference of Post and Telecommunications Administrations). For the committee, which obviously did not wish to see its central role cast into doubt, such a fear has disappeared.

Those procedures will be perfectly suited for use with manufacturers working together within the Eureka framework. Furthermore, products and equipment produced under Eureka's imprimatur will not have privileged access to the open market, so the rules of competition set up by the Treaty of Rome (which to date has been poorly respected in the area of open markets) should not suffer. Nevertheless, Mr Narjes does not seem totally reassured; he has indicated that the committee would remain vigilant.

The surest means of removing whatever doubts might remain concerning Eureka would certainly be to demonstrate the program's effectiveness, to show that the approved projects are carried out effectively, and that concrete results are obtained. That is why the ministers have agreed to evaluate the projects at least once each year.

Thirty-Seven Projects Adopted

The projects that were brought under Eureka's wing in Stockholm are quite varied in size and content: small nonpolluting thermal energy plants, new drilling systems that are entirely automated, artificial tomato seeds, security of access to computerized data systems, new industrial turbines, etc. The investments collectively committed range from 500,000 European Currency Units, or Fr3.5 million, to 400 million European Currency Units, or Fr2.7 billion.

The largest of the projects, with funding of Fr217 billion, involves EPROM memory. Thomson Semiconductors and the Italian firm SGS [General Semiconductor Company] are equal partners in the project, which is aimed at joint development of integrated circuits with nonvolatile memory of very high capacity (4 megabits, and eventually 16 megabits).

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CSO: 3698/246

FRANCE IN 10 NEW EUREKA PROJECTS APPROVED IN STOCKHOLM

Paris ELECTRONIQUE ACTUALITES in French 9 Jan 87 p 2

[Article by R.V.: "Ten New Eureka Projects for Our Industries"]

[Text] Ten new Eureka projects involving French industry in the fields of data processing, electronics, and electrical equipment were approved on 17 December in Stockholm at the fourth ministerial conference of the European cooperation program.

A total of 37 new projects were adopted in the Swedish capital, 13 of which involve French participation.

The EPROM project which, at a cost of Fr1.8 billion (including a French share of Fr910 million) over 5 years, links Thomson Semiconductors and MGS, involves the development and manufacture of a nonvolatile integrated memory circuit of 4 megabits, with research into extending this to 16 megabits.

Jessi, another microelectronics project, joins Thomson, Leti [Electronics and Data Processing Technology Laboratory], Philips, and Siemens, in the production of integrated circuits with more than 10 million transistors. This project will be developed initially in a single definition phase lasting 9 months and costing Fr35 million. It will be oriented in three principal directions: tools and methods of [computer]-aided design, basic technological processes, and the engineering of production shops.

Digital Broadcasting

The DAB (Digital Audio Broadcasting) project linking Thomson, Philips, AEG, and Bosch/Blaupunkt will be concerned, as its name implies, with the use of digital techniques in the area of radio transmitting. Its cost: Fr250 million.

In the field of data processing, the large Oasis project will involve the use of a pilot network to develop and test methods of coding data to ensure security all along the data processing chain. It will involve approximately 10 firms and research centers, including Cap Gemini, IRIAM [Marseilles International Institute for Robotics and Artificial], and

LIFIA [Basic Data Processing and Artificial Intelligence Laboratory] in France. Intended to last 8 years, the project is to cost Fr690 million, including a French share of Fr172.5 million.

There are three projects of note in the area of computer-integrated manufacturing, The first, called Famos, is aimed at identifying and selecting flexible and automated assembly systems for pilot projects. Intended to last 1 year and to cost Fr12 million, it includes numerous manufacturers in seven countries.

Fiabex is a project for the development of tools designed to ensure the operating safety of manufacturing systems. CEP represents France in this project, which is to cost Fr10 million over a period of 2 years, including a French share of Fr3.6 million.

Another project in computer-integrated manufacturing is related specifically to the oil world. It involves the automation of oil drilling projects. Alsthom will participate in this endeavor, dubbed Eurofar, which will last 5 years and cost Fr178 million (including a French share of Fr71 million).

It should also be noted that Serete has joined a Eureka project christened at a preceding conference. The project involves the development of "computerized engineering units" and is to cost Fr100 million over a period of 3 years.

Finally, two "electrical" projects should be noted. The first involving the participation of CGE [French General Electric Company], Alsthom, and Stein Industrie, is aimed at the development of a 300-MW coal plant. The project will last 5 years and cost Fr165 million.

The second project, named Eurodyn, involves the development of a tester for two MW radial gas turbines. Turbomeca is a partner in this project, which is to last 5 years at a cost of Fr330 million, including a French share of Fr150 million.

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CSO: 3698/246

NORWAY: TECHNOLOGY SMUGGLING INCREASES

Oslo AFTENPOSTEN in Norwegian 4 Apr 87 p 10

[Article by Arild M. Jonassen]

[Text] Repairmen and other representatives of the computer industry are smuggling diskettes and small spare parts for computers worth hundreds of thousands of kroner. Last year about 10 cases of attempted smuggling were revealed in Fornebu--and the problem is growing.

"Even spare parts for computers are subject to licensing according to COCOM regulations that restrict the export of high technology to East Bloc countries," said Oddvar Saether, control chief at the Fornebu District Customs Office. COCOM is the international "coordinating committee" for these matters.

Many repairmen explain their activities by pointing out that it is too complicated to fill out the customs papers and, for this reason, they enter the country in "green zones" with valuable computer equipment in their suitcase or in their inside pocket.

Chief Saether said that two of the smugglers who were caught last year had diskettes worth over 200,000 kroner.

"All but one were arrested for smuggling inside the country. One Norwegian repairman attempted to take spare parts along to Moscow without a license."

Most of the cases of attempted smuggling were reported to the police.

The goods that the suspects attempted to smuggle were confiscated for the benefit of the national treasury, but in cases involving companies that are dependent on a certain computer part that has been confiscated, the Customs Service has agreed to sell the parts to the company.

"After all, many companies are unaware that they are missing the parts in question, but this is true in all types of smuggling," Saether said.

Difficult Controls

"Our controls on the export of high technology are not good--and this worries us. Even if a supplier has received a license for exports to the East Bloc, in accordance with the COCOM regulations, it is impossible for us to tell if the computers we see being exported are the same as those listed on the customs documents," said Bernhard Hoiden, head of the Fornebu District Customs House.

Assistant secretary Aage Strupe of the Commerce Ministry is in charge of the Section for Export and Import Regulations, which issues COCOM licenses. He confirmed that the Customs Service must depend, to a great extent, on the exporter when the latter arrives with computer equipment that is licensed for export. Consequently, individual customs officers should be given special training. In addition, customs officers have a special adviser they can contact, according to Strupe.

It is possible to dispense with the regulations. Export licenses for products that do not exceed a certain technological level can be handled by the Commerce Ministry. More advanced technology cannot be sent to the East Bloc before the application has been processed by the authorities in the various member countries (Japan and the NATO countries, except Iceland). They are contacted by the COCOM office in Paris.

"The equipment we deliver to the East Bloc goes primarily to universities, hospitals, telephone exchanges, and other public institutions in the civil sector."

But how do we know that the computer equipment remains at the site for which the license has been granted?

"The Norwegian manufacturers have visitation rights on service calls. The repairmen are required to report to us if there is any change in how the equipment is used."

Strupe believes that the large, serious exporters follow the rules and that the "dangerous" ones are the outsiders in the market.

"There are few who want to take a chance and break the rules by selling prohibited high technology. Most of the equipment produced in Norway and other countries is dependent on American components. The Americans can cut off the supply of components if the licensing restrictions are violated."

9336
CSO: 3698/386

BRIEFS

NORWEGIAN PURIFICATION FACTORIES TO PRC--On Monday the Norwegian firm Stord Bartz signed a contract valued at 45 million kroner in Beijing. Stord Bartz will deliver equipment for purifying wastewater and producing high-quality proteins that can be used in animal fodder. Division chief Jon Alsaker told AFTENPOSTEN that contacts between the Norwegian firm and a Beijing alcohol plant were first established 2 years ago. The final negotiations took 45 days. Alsaker described these negotiations as complicated, but constructive. The contract resulted from the fact that wastewater from alcohol production is highly polluted. Stord Bartz has specialized in equipment that purifies this water, while also producing valuable protein materials. [Text] [Oslo AFTENPOSTEN in Norwegian 31 Mar 87 p 43] 9336

CSO: 3698/386

MORE, CHEAPER PROFESSIONAL PERSONAL COMPUTERS FOR HUNGARY

Cudapest UJ IMPULZUS in Hungarian No 5, 7 Mar 87 p 12

[Unsigned note: "More Services, Sixty Percent Cheaper"]

[Text] In 1987 about 4,000-4,500 Professional Personal Computers (PPC) may reach the domestic market thanks to Hungarian manufacturers as a result of a competition announced last year by the OMFB [National Technical Development Committee], the OAAH [National Materials and Price Office] and the IPM [Ministry of Industry] in the spirit of a resolution of the Economic Committee. As Laszlo Pal, chief of a main department at the OMFB, said, in the period before the announcement of the competition Hungarian entrepreneurs were offering about 100 different designs the majority of which did not meet even the minimal compatibility requirements, did not offer enough in the area of services and were still offered at a very high price. The primary goal of the competition circulated in the middle of last year was to improve the quality of what was offered and to force prices down to a realistic level. Twelve enterprises and associations entered the competition. Five of them met the requirements, the most important of which was that production of the product should not be based exclusively on import; the goal is a rational combination of imported and domestic components. The judges considered it important that the added value of Hungarian origin should be as great as possible and that the product should be completely IBM compatible, and they were especially careful of legal and commercial purity, that the components to be imported should have export permits and meet Hungarian trade regulations in every respect. They have already signed contracts for 1987 with Videoton, the Percomp Association, the Proper Association, MTA COSY and the association of Csepel Electronic, Transelektro and Ramovill. These contracts fix the technical parameters, services and prices. According to the bids one can expect a price reduction of almost 60 percent, so the price of PCs will be between 90,000 and 120,000 forints, of XTs between 130,000 and 180,000 forints and of ATs between 200,000 and 260,000 forints. These prices include the fee for services and basic software. It appears that the planned 4,500 machines will satisfy the 1987 needs; should these change it will be possible to refine the agreements as the year progresses.

8984
CSO: 2502/47

NEW BULGARIAN-SOVIET 'AGROAVTOMATIKA' ASSOCIATION

Sofia ZEMEDELSKO ZNAME in Bulgarian 10 Feb 87 p 1

[Article by Georgi Nedev: "Territory of Progress"]

[Text] The output of the Electronic and Nonstandard Apparatus Plant (ZENA) in Tolbukhin has long been known to agricultural specialists in Bulgaria. The USAK [General Purpose System for Automated Control of Agricultural Transportation Facilities], KEDR, and other electronic devices and systems have already demonstrated their great advantages in monitoring and control of tractors, drills, and combines. Moreover, a great part of these electronic devices have also come to be appreciated by Soviet specialists.

Thanks precisely to the high quality of the products bearing the ZENA trademark, a new dimension has now been added to activities connected with development and manufacture of systems for automation of tractors and agricultural machinery. The Agroavtomatika Bulgarian-Soviet scientific production association, with headquarters in Tolbukhin, has successfully begun operation. To be more accurate, we should add that ZENA will be a unique proving ground where all kinds of new projects will be initiated.

There is unquestionably great appreciation, but the responsibility assumed by the personnel of the association is just as great. The Bulgarian and the Soviet engineers, agronomists, and technicians are faced with the task of combining their efforts to reach a single goad, accelerated development of scientific research, planning and design, and technological missions to development systems for monitoring and control of the technological processes of agricultural machines. At the same time, the scientific thought of the two countries in this sector will organize production and adoption of these systems, along with their equipment and diagnostic and servicing facilities.

As is explained by the deputy director of the association, engineer Lyudmil Rosenov, all these activities will be carried out by four Bulgarian and Soviet organizations, which will participate to an equal extent in them. The Bulgarian organizations are ZENA and the Radioelectronics Institute in Sofia, and the Soviet ones the Scientific Automobile and Tractor Institute in Moscow and the All-Union Institute of Agricultural Machinebuilding, also in the capital of the USSR. The jointly built scientific research, planning and design, and technological center with its experimental base and testing ground will also be an essential element in the work of Agroavtomatika. And again, in acknowledgment of previous experience, all these facilities will be in

Bulgaria. The Bulgarian scientific and engineering personnel will, of course, keep in step with their Soviet colleagues, who will work shoulder to shoulder with them. Thanks precisely to this joint brotherly work, in the next few years there will be a manifold reduction in the time required for development and introduction of new electronic systems. In this process, Bulgaria will establish itself as a manufacturer of electronic equipment for agriculture and will specialize in a new area, that of electronic applications for tractors. We see that the scope will be even broader when we remember that the Agroavtomatika association has another dimension in the Soviet Union. This will make agricultural machinebuilding even more modern and competitive.

6115
CSO: 2202/12

GDR SPECIALIST DISCUSSES OPTOELECTRONICS DEVELOPMENT

Magdeburg VOLKSSTIMME in German 30 Jan 87 p 4 of Supplement

[Interview with Prof. Dr. Richard Tessmer by Manfred Zander: "Information Flow Across Glass Networks"]

[Text] Our discussion partner is 45 years old, married and the father of two daughters. He studied electrical and control engineering in Velten-Hohenschoepping and at the Technical University of Dresden. Comrade Tessmer has been teaching and conducting research at the Otto von Guericke Technical College in Magdeburg since 1961. Of particular importance are his achievements in the application of microelectronics to mechanical engineering. Today Prof. Dr. Tessmer is director of the Department of Technical Cybernetics and Electrical Engineering.

[Question] Professor Tessmer, one of the magic formulas with the help of which we hope to open up the future is optoelectronics. What does this concept signify?

[Answer] Optoelectronics deals with the transformation of optical into electronic signals and vice versa, to put it briefly. To be sure, this key technology is older than its name. Optoelectronical components such as photo cells have been known for several decades. But only when these components began to be used in combination with microelectronic components did the concept of optoelectronics emerge at the beginning of the 1970's.

[Question] You are concerned with an important branch of optoelectronics, the transmission of information via light waveguides. Could you describe this field in somewhat greater detail?

[Answer] The possibility of sending light with low loss over a glass "wire" was the godfather when, also in the early 1970s, optical information transmission was born. Of course, other prerequisites also had to be met. For example, the glass for the fibers, which we describe as waveguides for light, had to be of such a high degree of purity that one would be able to see just as clearly through a sheet 450 m thick as through a normal pane of glass.

A distinction must be made between two areas, long-distance and short-distance transmission. Long-distance transmission is better known to the public and is

also further developed. It includes information transmission via light waveguides over distances of more than 3 km and is used particularly in communications technology. In Berlin, a 16-km-long stretch for 120 telephone conversations was made operational as early as 1981. Additional lines have been added since then. At the present time, there is a glassfiber network of 800,000 km that stretches across the globe, with an annual expansion rate of 40,000 km. Interesting projects are underway. For example, by 1990 Moscow is to be supplied with television programs solely by means of glass cables. A 6,000 km transatlantic cable is planned between the United States and Western Europe.

Compared with these developments, so-called short-distance transmission has made progress in recent years only. This type is of special importance for the construction of automated systems. The "ghost" shift in factories of the year 2000 is inconceivable without adequate optical information transmission. This is the area targeted by our research project "Local Computer Networks Based on Light Waveguides."

[Question] It even makes sense to a layman that ordinary copper cable cannot be exchanged for a light waveguide. What problems require particular attention in your research?

[Answer] To put it very simply, the following takes place in optical information transmission--let us say between two computer systems: a module transforms an electrical signal from the computer into an optical signal which is encoded by a transmission module and fed into the waveguide. The light waveguide carries it to the receiving station, where the optical signal is re-converted into an electrical signal, since the computer can process only electrical signals.

But we wish to link not only two, but several computers. The information flow should move in more than one direction. How does Computer I know that the information from the mainframe is intended for it and not for Computer II? What happens when a computer that has been addressed is defective? We are in the process of developing an optical bus system, which will make it possible to send optical signals in all directions and to receive them from all directions. An important problem is how to link the glass fibers to other optical components. No interfering attenuation of the light wave may be permitted as a result of glueing, bonding, coupling or branching. All in all, the development of such optical information transmission networks is more costly than traditional systems. However, the benefits are considerably greater.

[Question] What advantages does optical information transmission offer?

[Answer] Large amounts of copper can be saved: one kilogram of glass replaces 12 tons of copper. Only 27 grams of quartz glass are required for a kilometer of glass fiber. One important advantage, particularly for applications in automation technology: glass fiber cables are not susceptible to electro-magnetic fields, such as those frequently encountered on shop floors. And glass fibers allow a much greater information flow than do traditional copper cables.

NEW FIREPROOF MATERIALS FOR BULGARIAN METALLURGY

Sofia VECHERNI NOVINI in Bulgarian 13 Feb 87 p 4

[Article by Simeon Danevski: "An Original Bulgarian Technology: Non-molded Fireproof Linings"]

[Text] Breakthrough in manufacture of fireproof materials accomplished by specialists of Ferrous Metallurgy Institute--High economic and social effect achieved--Bulgarian-Soviet metallurgical lining association to be established

In both ferrous and non-ferrous metallurgy, one of the most complex current problems is associated with production of fireproof materials and their application in the metallurgical plant. To many persons this operation is an essential part of the complicated invisible processes that take place in the blast furnace or converter. But in the past the problem has somehow been left in the background, even though a blast furnace without the necessary lining (facing) is inconceivable.

"Without a lining there would be no blast furnace," says Stefan Bagarov, deputy director of the Ferrous Metallurgy Institute in Sofia. "The furnace lining makes it possible to reach the high temperatures inside the furnace without which chemical processes cannot take place. And it is just for this reason that this lining is subjected to effects of all kinds. It is the part of the lining which fails the earliest, and it must be repaired promptly. And this process continues to be the most difficult one. The furnace is shut down and there is a long wait until it cools down. Then pulling down the bricks begins. This is a very difficult, unpleasant, and labor-intensive process. These circumstances have induced us to look for a technological method and to produce refractory materials which, while keeping their physical and mechanical properties, are easier to apply and eliminate this heavy human labor."

And so the first Bulgarian breakthrough has been made in this area. Specialists of the institute have succeeded in developing a non-molded fireproof material not inferior in any respect to the costly firebrick that has been used up to the present. In addition, the material is even superior to firebrick in stability, and also increases the economic and social effect significantly.

A characteristic of this fireproof material is that it is in bulk form rather than in the well-known brick form. It is applied directly and does not

require shaping, press molding, and firing. Electric power consumption is substantially reduced. The recently developed fireproof material has a moisture content of less than 7 percent or is entirely dry. Under the action of vibrators, these moisturized compounds become mobile and can fill any space that needs to be lined. Another great advantage is that the material sets much more rapidly following vibration, so that the facility can be activated more promptly. The total economic effect will amount to several million leva annually when it has been introduced throughout the national economy. This is only one example clearly illustrating the enormous benefit to Bulgarian metallurgy from adoption of monolithic fireproof compounds in production. While previously nozzles lined with ordinary firebrick could withstand two or three melts, as many as 200 melts can be completed with the new fireproof materials when cast iron is treated with magnesium. In addition, the new vibratory materials, as is to be expected, are much less costly than the imported ones. Nearly 400,000 leva will be saved for the national economy each year from suspending imports of such materials.

Our discussion with Stefan Bagarov continues. "The economic effect achieved is very high and varied. Take transportation costs as an example. A large number of bricks have been broken during transportation in railroad cars alone, despite the fact that each of them has been carefully packed in special paper. And a single firebrick costs more than 10 leva. This trouble has now been eliminated. The fireproof compound is simply loaded on freight cars by the most common method and this does not harm it. It will be very widely used, primarily in metallurgy, but also in the ceramic and petrochemical industries and in construction. Hence the method developed at our institute will be widely applied in the national economy. And it must be pointed out that the new technology for producing a lining from non-molded fireproof materials is a major achievement of Bulgarian metallurgical science that has earned a high reputation and recognition."

The Bulgarian technology for producing non-molded fireproof materials is already protected by an inventor's certificate and interest is being shown toward it abroad. An intergovernmental decision has already been made to establish a Bulgarian-Soviet association, something which will lead to the development of new refractory materials. The scientific potential of our Ferrous Metallurgy Institute will receive serious and strong support from the Khar'kov Scientific Research Institute of Ferrous Metallurgy in solving complex problems associated with production of refractory materials used in metallurgy. The process from development of technologies to their application is such that it is very complex to cover and solve quickly the difficult questions which arise. With powerful material resources available to it, the Bulgarian-Soviet association will have the potential for solving these problems.

6115
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ORIGINAL BULGARIAN TECHNOLOGY FOR SEMICONDUCTOR ELEMENTS

Sofia OTECHESTVEN FRONT in Bulgarian 25 Feb 87 p 2

[Article by Antoaneta Gurkova: "Microelectronic Secrets Mastered"]

[Text] Bulgarian successes in the area of molecular epitaxy are awakening wide international interest.

A new and fundamental technology for production of semiconductor elements has been developed at the Institute of Solid State Physics. Scientists of the Bulgarian Academy of Sciences and of the Academy of Sciences of the USSR have built two similar automated units for second-generation molecular epitaxy. The progress of scientific research has been accompanied by enhancement of the industrial facilities needed both for developing experimental models and for building industrial installations. This completes the first complex stage of the project for development of molecular epitaxy in Bulgaria.

Molecular epitaxy is a physical process of formation of a monocrystalline layer on a substrate similar to it that is also monocrystalline. Crystals grow on the surface of the heated substrate placed in a superhigh vacuum. The material needed for growth is positioned by several flows of varying composition and intensity. The entire process is controlled at the atomic level.

By using this method, scientists can freely construct semiconductor structures and devices and develop materials that do not exist in nature. They grow new crystals by arranging atomic layer on atomic layer of the atoms that are needed and by positioning the atoms where required. We can imagine what optoelectronic and microelectronic instruments we will have to work with in the future.

A Little Background

The concept of developing an industrial technology based on growth of special structures in a vacuum was advanced for the first time by a Japanese scientist, Leo Isaki, in 1976. Over a period of 1 to 2 years he designed special equipment at the IBM research center. Molecular epitaxy is now a fully established technology with great potential for improvement. An international conference on semiconductors was held in Stockholm, at which representatives from all over the world demonstrated spectacular innovations

in the form of a variety of semiconductor devices developed by the molecular epitaxy method.

The contributions made by Bulgarian scientists began in the laboratory of Academician Alferov at the Yoffe Industrial Physics Institute of the Academy of Sciences of the USSR in Leningrad, in the context of the postgraduate work of scientific worker Gencho Minchev. A number of studies were made of the physical processes; these studies suggested that all the shortcomings of the generally adopted technological process could be eliminated.

The new methods aroused great interest in the USSR, and in 1983 a joint Bulgarian-Soviet project was launched to develop two similar molecular epitaxy units. This program was carried out chiefly by the Institute of Solid State Physics and the laboratory of Academician Alferov. The project took 3 years to complete. In addition to the work on development of the two units in Sofia and Leningrad, Bulgarian scientists have prepared and will soon introduce a third, Bulgarian, unit in Plovdiv. These are some of the new developments. The Bulgarian-Soviet group has developed a technological process based on new and original ideas which provides the possibility of making substrates with an ideal surface. There is also a new approach to designing the evaporation assembly which eliminates the need for rotating the substrate (as is conventionally the case). Bulgarian scientists have devised an automated system which performs computer simulation, and this system will be used in the future to control the entire technological process.

By way of dialog with the computer, the production engineer prepares a model of the future semiconductor device (such as a transistorized laser). When all the features of the new model have been clearly defined, the computer continues to work on its own. It first automatically records on a magnetic information carrier (tape or disk) the instructions that have been given it by man. A computer program then begins to run, converting physical quantities into instructions to be carried out. Another computer system carries out the growing process itself. At the same time, a record containing all the activities performed is generated. A human studies and processes the data in the record and returns it to the computer. Subsequent simulation is based on these data, and so the computer corrects its own performance. Every process after this is carried out with increasing accuracy. The completed computer instructions can easily be reproduced and transferred to another, purely industrial unit which is capable of repeating the iteration process over and over again even after many years.

Preparation of the new technology, along with development of the necessary industrial resources, is beyond the ability of a single enterprise, a single institute, and a single government agency. It is for this reason that a program group consisting of scientific workers and production specialists was set up which included around 200 specialists from all over the country.

"We have accomplished very much," we are told by the director of the program group, candidate of physical and mathematical sciences Gencho Minchev. "We started from scratch. All this would not have been possible without the assistance and support of the BCP district committee in Plovdiv, which created the necessary infrastructure. Execution of the project has been based, and will continue to be based, on the facilities of the Institute of Non-ferrous Metals, the Central Laboratory for Automation of Scientific Instrument Making,

the Scientific Production Enterprise for Scientific Instrument Making, the small enterprise making sensors and sensor devices, and the Institute of Applied Physics. In order to build our molecular epitaxy unit, it was necessary to develop production of superhigh vacuum apparatus in Bulgaria. Only the initial scientific research experiments were performed by our group. Over the next 2-1/2 years we trained a group of young specialists and designed and started up regular production of the full range of items--assemblies, elements, and subsystems--for superhigh vacuum installations. These are general-purpose installations permitting the construction of everything we need.

"Bulgarian industry manufactures a great number of electronic devices, but they are universal devices, while we need unique interfaces of extremely high accuracy. No such devices are made in any socialist country, and so we have developed 40 types of electronic interface modules with the help of a number of groups of the Movement for Youth Technical and Scientific Creativity.

"In only 3 years we have completed an entire self-contained cycle of the instrument building industry, from scientific research to finished technological apparatus, on the basis of our own research and development and with our own support. Consequently, we can support our semiconductor industry with our own resources and will not be dependent on provision of Western technological equipment."

The success achieved in the area of molecular epitaxy in Bulgaria is arousing great interest among research workers in all socialist countries. A second international meeting of the working group on molecular epitaxy has been held in Plovdiv. It was attended by management personnel and leading specialists of Hungary, the GDR, the USSR, Czechoslovakia, Poland, and Bulgaria. The scientists decided that the infrastructure of production, scientific, and academic elements created in Plovdiv District constitute significant resources capable of supporting the work of an international research organization and accepted the proposal made by the Bulgarian Academy of Sciences for organization of an international molecular epitaxy laboratory in Bulgaria. A third meeting of the international working group will be held in Bulgaria in 1987. The statute, structure, and missions of the future international laboratory will be discussed at this meeting.

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STATUS OF ROMANIAN NUCLEAR ENERGY R&D

Bucharest ENERGETICA in Romanian No 10, Oct 86 pp433-437

[Article by Lucia Rosca, general director, Central Institute of Power Engineering Research, and Dr Mario Duma, chief, Prognosis, Data Processing, Management, and Power Engineering Economy Laboratory, Institute for Power Research and Modernization: "Current Energy Research Problems in Nuclear Power Engineering"]

[Text] As we know, provision of energy, along with technically sound and efficient energy conservation, represents one of the major, central problems of the overall economic and social development of Romania and will continue to do so over the foreseeable short-term and medium future. In his speech at the plenum of the RCP Central Committee held on 23 and 24 June 1986, Comrade Nicolae Ceausescu, general secretary of the RCP, pointed out that "particular attention must be paid to development of raw materials resources and to the energy program. We must solve the electric energy problem in its major aspects by 1990. However, this presupposes the taking of resolute measures to implement the program for development of energy resources and start-up of power generation by coal-fired electric power plants, hydroelectric plants, and nuclear power plants."

As we know, the task was assigned at this plenum of "reviewing the nuclear energy program in the context of the need for increasing the degree of safety." In his speech, Comrade Nicolae Ceausescu reaffirmed that "the surest way of providing material and energy resources is to use energy and materials sensibly and continue to reduce their consumption."

These guidelines, which mark out the essential features of our energy development policy, define the organic institutional unity of the power engineering problem area, including the major role assigned to nuclear power engineering in Romania.

1. Problems of Romanian Power Engineering of Significance in Development of Nuclear Power Engineering

While we do not want to cite figures excessively, we will nevertheless begin by pointing out that Romania's total final energy consumption may in the current stage be divided into fourths. One-fourth is represented by electric energy, another by heat (so-called thermal energy) generated and delivered in the form of steam and hot water, and the remaining half is consumed by direct

use of fuels. The latter half also includes non-energy uses and use of fuels as the raw materials of various energy resources. The following comments can be made in connection with this breakdown.

1. In the advanced industrialized countries there is a higher share (around one-third) of electric energy ("degree of electrification of power engineering"), with a tendency toward ongoing increase through utilization of nuclear energy, as well as coal, and under the influence of other factors. The share of electric energy is substantially higher in some countries in which an especially large volume of nuclear energy is generated or in which particularly favorable conditions exist for hydraulic power.

It is to be noted that the law on the Unified National Plan for Economic and Social Development of the Socialist Republic of Romania over the 1986-1990 period calls for an increase in electric power production 43 percent higher than the growth of 36.4 to 40.6 percent specified for the social product.

Increase in the share of electric energy in final power consumption is not only a necessity imposed by the conditions of use of primary energy resources; it is also a requirement set by users. With the exception of autonomous highway and air transportation, in which liquid fuels continue to be preferred, and with the exception of industrial applications in which power supply is closely linked to the role of raw materials (such as coke in iron and steel making), along with other exceptions of lesser importance, electric energy is an energy vehicle especially suitable for users. It allows achievement of high labor productivity and of high quality because it is clean and because of its adaptation to the varied conditions of energy location and release of energy, this facilitating non-conventional technologies, mechanization, automation, and cybernetic applications, and so forth. Increase in the degree of electrification of power engineering into which nuclear power engineering is successfully integrated is thus a general trend of present-day technical progress.

2. The second comment to be made is linked to a certain extent to the first one. Of the one-half of the total final energy deriving from consumption of fuels by direct use, a substantial part is represented by heating processes at low and medium temperatures, in dwellings and in a number of technological processes. This is the portion that can be handled by central steam and/or hot water supply plants, to the extent that the consumers themselves are locally centralized to a sufficient degree. Another part of this direct fuel consumption is in high-temperature heating processes (including food preparation processes), which in theory could in a number of cases be conducted with electric power, just as could many low-temperature and medium-temperature heating processes in which the conditions are such that the problem cannot be solved by centralized supply of heat.

3. There are three categories of urgent problems to be solved in this sector as a whole: the availability of the respective forms of substitute energy, energy efficiency (the overall yield of technological power generation processes, starting with primary energy resources and ending with useful consumption) and the problems of costs and economic efficiency. It should be noted that the general result of the solutions arrived at in this problem area, as practical international experience has shown, favors shift to the substitute energy forms referred to, gradually and on a case-by-case basis, of

course.

The foregoing considerations reveal the importance of developing nuclear power engineering in the direction of electric power generation, but also in that of heat generation, both by district heating from electric power plants (a solution which simultaneously permits more efficient energy utilization of nuclear fuel) and by building nuclear thermal power plants. As is known, these new areas were not taken into account in the Romanian nuclear program. While they have been carefully monitored throughout the world and approached years ago in Romania as well in various studies, these new areas have now been incorporated formally into the Integrated Program of Technical and Scientific Progress and the necessary detailed study is now to be made of them for Romanian conditions in research in all the sectors involved.

Coming back to the immediate present and the near future, and to electric energy in particular, we find that for the time being the situation is marked by changes in the power engineering structure resulting from application of criteria to assure technological optimization, but also from efforts to make up for the power and electric energy deficit and compensate for restrictions on energy supply, and, as another direct power engineering consequence, the situation is characterized by effprt to arrive at suitable quality parameters, quality parameters in particular, in the national electric power system.

As regards electric energy we may say that, although Romania has a nominal installed capacity which should fully cover its needs, factors of various kinds tend to make energy unavailable. Some of the major coal-fired thermoelectric power plants are not reaching either the rated capacity level or the necessary availability over time, as a result of quality deficiencies in certain plants and equipment deriving in turn partly from the unsuitable quality of some component materials. This is due to the quality of coal, which is lower than had been specified in the design and fluctuates because it has not been monitored as it should have been, and to deficiencies in the quality of operation and maintenance.

The installed capacity of power plants fired with hydrocarbons (diesel fuel and natural gas) is affected chiefly by the need for rigorous conservation of these costly and scarce resources.

As regards hydroelectric power plants, the years of drought, added to the chronic energy shortage, have led to operation of hydroelectric power facilities with low water levels in reservoirs. This has an adverse effect on the power available and the amount of peak energy that can be supplied.

In addition to the program in question for nuclear power plants, extensive programs are in progress for construction of new plants, such as lignite-fired district heating and electric power plants, hydroelectric power plants, and the Anina slate-fired thermoelectric power plant.

The foregoing discussion and the examples in the area of electric energy show that the problems linked to the technical level and quality of design of power plants, installations, and equipment, the level of the overall solutions, and even the specific details of all the components of power engineering facilities, including technical coordination of these components, has a direct effect on the development of power engineering itself and on solution of the

energy problems of the economy as a whole.

These are practical findings which we must take into account in all our future activities, and all preventive measures must be taken to assure the quality of Romanian power engineering facilities. Insofar as Romania is concerned, the main area of interest is represented by the role and responsibility to be assigned to scientific research and technological engineering in assuring this quality for power generating facilities--the overall design, production systems, installations, equipment, and all their components. In retrospect it must be said that power engineering can be blamed not so much for having adopted engineering solutions that have not proved valid in practice as mainly for not participating sufficiently in the process of establishing future engineering solutions, both as regards the design of investment project facilities and power engineering technologies and as regards the power generation equipment systems utilized.

2. Institutional Implications of Nuclear Energy in Overall Development of Power Engineering

Nuclear power engineering is not an autonomous, self-contained remedy that can be applied in a predetermined location, that is, isolated on a purely quantitative basis from the power engineering system of Romania. On the contrary, when it comes on the scene, it has a profound impact on the development of power engineering as a whole.

The problem of determining the locations of nuclear power plants, along with their components, is well known. One difficulty is that of covering the areas of the country in which there is a shortage of electric power, in the context of the imbalance caused by the relative excess of conventional energy resources in the southwest, especially now that restrictions have been placed on use of the natural gas found in the central area of the country. This imbalance has caused further complications in the electric power line structure. Additional difficulties are caused by the restrictions associated with provision of cooling water and the restrictions imposed by safety considerations, together with the contributing natural factors and public utility considerations. The requirements for delivery of pressure from nuclear electric and district heating power plants and thermoelectric nuclear plants, at the current level of engineering solutions permitting economical transmission of thermal agents (steam and hot water) only over limited distances, introduce additional essential factors into analyses and decisions relating to the locations of nuclear power plants, along with the higher priority that must be assigned to research on new, non-conventional solutions for local use of the heat generated in all categories of power plants in the condensation mode and for transmission of heat over long distances. At the same time, the development of nuclear electric power plants accounts for a significant portion of the structure of industrial water consumption and looms large in thermal pollution of waterways. In the national electric energy system, increase in the share of nuclear power plants, together with coal-fired and district heating plants, will lead to development of production facilities of a new type for Romania, pumped storage reservoirs, and under certain conditions reservoirs with reversible-flow assemblies, for processing the variable portion of the electric load schedule. Efforts will be aimed simultaneously at ensuring more efficient utilization of all hydroelectric power facilities so as to increase the power that can be generated in general

and peak power in particular. In this context research, primarily future research, on long-term accumulation of heat in industrial amounts, involves both conventional power engineering, along with new energy sources, and nuclear energy in the effort to respond efficiently to variations in the thermal load curve, with its distinct features in various localities, areas, and seasons. In this concise survey we are unable, of course, to include a number of other new elements which the appearance and development of nuclear power plants will introduce into the operating conditions of the national electric power generating system.

The increase in the degree of electrification of power engineering associated with the development of nuclear power engineering and coal has its ramifications also in technological and power engineering research in sectors and processes which currently consume other forms of energy. These sectors and processes will have to find highly efficient solutions for future use of electric energy with high yields and with qualitative technical advantages justifying extension of the use of electric energy on the national scale. This is a stage for which, we repeat, we must prepare ourselves from the engineering, scientific, and technological viewpoints, but one which should be subjected to rigorous critical examination during the current stage of electric power and energy shortage.

We believe that it is necessary to identify additional significant channels of interconnection between the development of nuclear power engineering and the overall development of Romanian power engineering, and in particular of the national electric power generating system. What we have in mind is the interdependence established at the level of consumers of general resources not associated with power engineering but needed for creating new power engineering facilities: facilities in machine (tool) building, product introduction facilities in this specific area, construction and assembly facilities, amounts of construction materials, metals, etc; financial resources, including foreign exchange, human resources--personnel with the necessary skills and capabilities (including personnel for production and operation); and, lastly, scientific and technological resources--research and other facilities. We think we are not wrong in saying that the quantitative and qualitative availability of these resource categories at the level of the national economy and society is a factor slowing down the pace of development of power engineering resources as a whole and that of solution of the power engineering problems with which we are faced. There is need for optimum allocation and utilization of each these categories of limited resources, on the basis of the promptest and most stable possible maximum contribution to balancing the energy budget and to creation of conditions for ongoing economic and social development from the viewpoint of energy supply potential, with the length of the technological cycle required for completing each type of facility simultaneously included in the calculation. All these factors can, in different ways, influence alternative decisions on the rate and proportions of evolution of the future optimum structures of Romanian power engineering. This is one of the many unresolved problems confronting Romanian research. It can be solved only through direct participation by specialists in all sectors and subsectors of power engineering and allied areas, in order to make available the elements needed for scientific, technical, and economic substantiation of energy development programs. And it goes without saying that no figures on nuclear electric energy "requirements" can be arrived at unless such analyses are made. This is so, firstly, because the total

electric energy requirement must be appropriately distributed among the various potential sources, on the basis of power engineering and technical-economic criteria and the possibility of completion over time, and secondly, because this electric energy requirement itself is not an unchangeable given resulting from coordination with the other forms of energy. This requirement also derives from the macroeconomic optimum balance between energy provision and direct and indirect conservation of energy in the national economy.

3. Scope of Research on Nuclear Electric Power Plants

The following three fundamental assumptions are taken as a basis in outlining the scope of research on nuclear electric power plants:

1. Any nuclear electric power plant forms a unified whole, a technological system, the functionality of which must be ensured by coordinating the parts that make it up and the specialties that contribute to its development.

2. Generally speaking, for all categories of power engineering facilities the initiative for technical progress and optimization of engineering solutions must be assigned both to energy research and to specialized research on various types of equipment or components of power engineering facilities. In this context, energy research should reflect the needs of the user and should be based on energy production flows and systems as a whole and on operational considerations. At the same time, it alone has the task of solving the specific technical problems connected with different power generating facilities for which there is no specific manufacturer. In their turn, research workers in special areas--in the general case, for example, those doing research on power engineering equipment and in the present case specialists concerned with the nuclear portion of power plants--are the ones who promote technically progressive trends deriving from their own areas of specialization. All the participants in this complex process of innovation must cooperate, however, and must coordinate on a sound basis the initiatives, criteria, and interests of the technical sphere which they represent and in the spirit of which they act.

3. New and complex systems such as nuclear electric power plants must be supported by scientific, theoretical, and especially experimental research, to the extent possible, as regards both components and a particular system as a whole, although this process is generally difficult to accomplish.

We are also aware of the reality that, while up to the present much original research has been initiated and completed on the nuclear portion of nuclear electric power plants, the subject of power plants as a whole and that of the portion of these plants that is termed conventional has not been dealt with in Romanian research in power engineering, at least over the last decade, while planning, design, and building of the first nuclear facilities are in full swing. Consequently, the specific problem faced is that of involving energy research in drawing up the nuclear program in the immediate future, in solving the set of problems connected with power plants operating with future generations of reactors, where we believe openings will continue to exist for nuclear energy research, being left aside for the time being for another stage.

We believe specifically that energy research should contribute to revision and implementation of the nuclear program by carrying out projects in the following categories.

Predetermination and specification of the aggregate operating modes and conditions possible in the course of operation of nuclear electric power plants;

Elaboration of a system of coordinated topics, characteristics, technical specifications, and interfaces between the component elements of nuclear electric power plants, primarily between the nuclear element and the portion termed conventional, among various subassemblies, aggregates, and equipment, including integration into the national power system and the environment; elaboration of methodologies for creating and verifiying (testing) these conditions in the planning and design and the activation stages; conduct of specific analyses in connection with creation of the conditions in question;

Establishment of the conditions and elaboration of all the details of engineering solutions specifically for nuclear power plants, for different assemblies, equipment, and apparatus in the conventional portion of these plants; solutions for thermal systems and networks, turbine assemblies, generators, and electric motors, including excitation systems, water chemistry, cooling assemblies, thermomechanical and hydromechanical circuits and equipment, electrical apparatus, electric systems, internal services, secondary electric circuits, automation plus data processing facilities for the conventional portion and for the plants as a whole, and so forth;

Technological solutions and apparatus for preparation for activation and operation of nuclear power plants, for monitoring operation, maintenance, and diagnosis of the condition of assemblies and equipment;

Research in connection with solutions for supplying heat from nuclear district heating plants and from nuclear thermoelectric power plants.

A number of other problems included in the special area of nuclear physics and power engineering are of major interest to energy research. For example, there are components and aspects which directly affect the operation and running of power plants as a whole, such as handling and management of nuclear fuel and radioactive waste, and even the serviceability of the principal conversion assemblies. Similarly, the problem of nuclear safety for one thing justifies a multiple and many-faceted approach because of its importance, and for another is per se inevitably linked to power engineering safety (as regards pressurized assemblies), electric safety, earthquake stability, and protection against fires and other sources of disasters. The safety measures must be designed and verified mutually and interdependently by all the specialized agencies involved.

Lastly, power engineering research, which is responsible from the scientific and technical-economic viewpoints for solving the current and future problems of the national energy budget and problems of efficiency in generation and utilization of energy in the economy, has the mission, along with specialists in various types of energy resources, of making a comprehensive evaluation, at the level of the national economy and for the future, of the energy and economic efficiency of the alternatives for preparation of the development

program. It must for this purpose establish criteria reflecting as faithfully as possible all the real nuances of the energy policy and of the progress of science and technology in power engineering. It is obvious that in the age of nuclear power engineering the criteria must be new ones, particularly since the most recent events in this sphere have led to a process of reconsideration whose ultimate consequences and conclusions have not yet been formulated. It is still a field awaiting close scientific cooperation among different spheres of research.

We must be capable of achieving cooperation among various sectors to make the most comprehensive and complete possible power engineering, economic, and ecologic analyses of nuclear power generating facilities for the entire cycle from development to, and including, decommissioning.

The complexity, responsibility, and urgency of the problems of nuclear power engineering development in Romania fully justify the undertaking of specific new actions and measures to promote solution of these problems through energy research.

6115
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HUNGARY: BENEFITS OF DATABASES STRESSED

Budapest UJ IMPULZUS in Hungarian No 5, 7 Mar 87 pp 14-15

Statement by Information Director

[Interview with Mihaly Agoston, director general of the National Technical Information Center and Library, by E. Sz.: "A Need for Domestic Databases; They Can Perform Miracles..."]

[Text] At the most recent meeting of the Innovation Circle Mihaly Agoston, director general of the OMIKK [National Technical Information Center and Library], analyzed the reasons for the domestic backwardness in professional information exploitation in a talk titled "Information is Power--Information is a Vital Question." In his opinion the greatest obstacles to swifter progress in this area are the unsatisfactory institutional system for information, the undeveloped nature of the mediating system of intellectual and material tools and a sort of informational simplicity on the part of domestic experts. Mihaly Agoston gave our journal an interview--also summing up the essence of what he had said--and our reporter describes the observations which followed the talk.

The information hunger of our age is well known. We also know what a great problem the flood of information causes; it must be processed to be used. Fortunately, with modern electronic tools and transmission technology, this task can be solved, although expensively. Knowing our economic difficulties, however, it seems doubtful that we can follow the pace of information processing and use which has developed internationally. We put our questions to Mihaly Agoston, director general of the OMIKK.

[Answer] Knowing our backwardness we must handle the question of information in a self-critical way. When we talk about informatics we are talking about our level of modern information. We would like to make ourselves and each other believe that we are informed rather than admit the opposite. We seek an avenue of escape from the "information flood" and many feel that they can successfully oppose to it our life experiences or even the intuition we are born with. But if we look at those countries to which we export our industrial and agricultural products we are immediately struck that there is a close correlation between the devaluing of Hungarian goods and the backwardness of domestic information services. We also suffer no small losses within the

country for similar reasons in state life, in public administration, in management, in the area of the infrastructure, and I could go on....

[Question] Because we do not have the money to build up a domestic information service....

[Answer] If we are to talk only of money, the shortage of it raises the well known dilemma--which came first the chicken or the egg? In a curious manner it is not the rich countries which need effective information development but rather much more those countries which manage under bad conditions. In the FRG they recognized the value generating and producing power of information, and with this recognition the FRG got well ahead of us. They recognized that information takes on intellectual value embodied in their products; this value is proportional to the up-to-date professional information, whether we are talking about engineers, merchants or government officials. The essence of our backwardness is a sort of intellectual behavior not free of petrification. Analyzing this is an urgent task, for without it the mills of the Hungarian informatics institutions will continue to sort, or make consumable the volume of information obtained on both domestic and international lines, with a good bit less efficiency than desired. We will be able to broaden the market for our sales and expand the demand side for information, as a value generating commodity, only at the price of great difficulties and only late.

[Question] This is certainly so, and that is why we sometimes see in industry and at some developmental institutes initiatives aimed at organizing databanks and connecting directly to international sources. What is your opinion about this?

[Answer] I also could list good examples. There are such at all of our information institutions, and as you say there are pioneering initiatives at some developmental and even producing enterprises. But all these only prove that the information demand is very strong and will force a path for itself even in the absence of money. This is favorable, but it is far from sufficient. The source of the trouble here is to be sought primarily in the lack of a carefully developed information policy. In the developed capitalist countries, and in a few socialist countries, in the Soviet Union too, the national informatics programs are formulated and regularly developed further at the level of government policy. UNESCO has given world significance to such high level solution of the problems and has issued a study about it.

[Question] What is the essence?

[Answer] The forces encouraging the development of information networks can be traced back to three chief sources. The first are the economic and time constraints which prompt the information structures to share and not duplicate information and other resources. In addition there has been development in communication (information) techniques and technologies which realizes multimedia information integration in single communication channels, while making use and the dissemination of information simple. Finally there is the swift growth of machine readable information files and databases throughout the world with direct, that is on-line, access to them.

Theoretical research connected with information, the practical utilization of specialized information in research, development, production, marketing, education--especially higher education--and even in the sphere of culture, and the incredibly swift development of information techniques combine to encourage international information flow and with it the building up of information networks. A national program for development follows from the sum of all this, and this is primarily a government task.

[Question] What are our chances?

[Answer] Possessing a well thought out information policy we would have a chance to catch up. But we must reckon with the fact that the consumption of information is incomparably greater in the Western European countries, and as for our domestic informatics institutional system, most of it still manages from the budget, and we know what that means. On the other side we also suffer a shortage in technical tools, which, of course, one can comfortably tolerate if one has budgetary allotments. So it is not so much a lack of equipment as a lack of modern information management; that is, some institutions are incapable of producing the necessary technical background. Another problem is that, again only in the absence of a government information program, our information institutions and the customer market for them are not coordinated, not goal oriented. In the developed countries, in contrast to this, the governments contribute materially, in a differentiated way and tied to precisely defined conditions to be sure, but still they contribute to the swifter and well coordinated developments.

[Question] And how do you judge our situation?

[Answer] It is said that by building up our Hungarian language databases we might make our own information service a good bit more effective. They explain this by saying that guidance is much more centralized for us than for them, and in the case of building up an information service network this could be an exceptional advantage. By developing such a system we would have a way to perform miracles--as they say--in the area of guidance and information. Hungarian language databases citing the technical literature could have an important role in providing information to medium and small plants and undertakings, in general everywhere that they do not have a suitably qualified intellectual potential, experts who could make adequate use of the large international databases and services. But neither should we ignore the advantages of regular data transmission and reception on the international information lines. Let us take, for example, market research, the problems of marketing Hungarian goods. We are talking about an indispensable system of tools for finding foreign partners, which our information service might aid very effectively. But in general the providing of information to those abroad is more than a business interest. The level of development and the achievements of the Hungarian intellectual and economic potential might be measured by the level of the foreign side of our information service.

Comments on Slow Progress

Budapest UJ IMPULZUS in Hungarian No 5, 7 Mar 87 p 15

[Note by K. K. G.: "With Leaden Tread"]

[Text] "We are inclined to think that a bicycle is an airplane. But it is not right to push a lever and call a system providing data an information system," complained in a passionate voice one of the speakers in the unusually sharp debate following the talk by Mihaly Agoston. With all this, of course, he hardly intended to question the significance of the efforts which the director general of the OMIKK had called a source of hope.

Much has happened since last year to put the domestic professional literature into a more comprehensive database. But in regard to how to precisely define the two concepts under discussion the participants did not succeed in reaching a common denominator even by the end of the debate. The fact that their opinions differed to such a degree in terminological questions is a graphic illustration that the domestic social acceptance and evaluation of information plods decades behind the world forefront.

Abroad the proportion which countries and their populations turn to on-line access to databases is regarded as a measure of the value of information. This figure--according to data given in the talk--is 750 times greater in the United States than in Hungary! It is 150 times greater than ours in Japan, an average of 50 times greater in Western European countries and 30 times greater even in Austria and Finland. And in the meantime our products must be competitive on those markets.

It is not worth debating the negative European record of the Hungarian Post Office in telecommunications--of the existing data transmission stations, about 400 of them, only 35 are suitable for solving interactive tasks. By comparison, one speaker noted, there are 10,000 terminals in operation in Japan. There were some who simply waved this aside, saying that the 35 domestic terminals are only 30 percent utilized.

Why? A number of people pointed out that because of the lack of language knowledge (among other things) we cannot even take advantage of the existing possibilities. According to a recently prepared survey only 14 percent of the technical experts are capable of communicating in a language other than Hungarian. We learn from the same study that among the older generation German language knowledge is the more common, Russian dominates for the middle generation and in the case of younger experts a knowledge of the English language is increasing dynamically.

All this--at least as a trend--is favorable, Mihaly Agoston said, for the professional literature is prepared primarily in the English language. Of course, sooner or later these data also appear in the Russian language professional literature files more accessible to us, sometimes a year and a half later, when their value is dubious, since the speed of accessibility gives value to information.

But the expert who protested against the charge made in the talk that domestic technical people are insufficiently open to new information felt wounded in

his self-esteem. There is a hunger for information everywhere among technical experts, he said. But in Hungary today, according to him, professional data can be searched out only in an extraordinarily uneconomical way, in the intellectual sense. Who among the experts, he added, would not recognize the concept of a "literature search"; before starting any research and development theme it has to be "plotted out" with several weeks of work, collecting information in various libraries and elsewhere.

Some, during the debate, attributed the leaden stepped domestic progress in professional literature use to moral causes, to distortions in the system of values. But probably that speaker was closer to the truth who supported what he had to say with a representative enterprise survey done last year by the marketing branch of the Hungarian Chamber of Commerce. It was shown by the study that the enterprises are forced to pay much more attention to the struggle with the regulators than to the market. But information is really important only to those who must "coexist" with the market economically.

8984
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HUNGARY: MINISTRY PROMOTING INNOVATION PARKS

Ministry of Industry Position

Budapest UJ IMPULZUS in Hungarian No 5, 7 Mar 87 pp 10-11

[An interview with Antal Adam, deputy chief of the development main department of the Ministry of Industry, by Judit Redei: "Not Uniform; An Innovation Friendly Environment"]

[Text] "In the Apple manner here at home also"; "It is not yet timely;" "We are already late;" "An illusion of those without shoes;" "A panacea, but not for us..." The debate of the believers and the opponents is not yet decided, but at the innovation program recently held in Godollo the industry again and unambiguously took a stand for creating innovation parks.

We asked Antal Adam, deputy chief of the development main department of the Ministry of Industry, why the ministry was voting for the creation of innovation parks.

[Answer] We think that the operation of innovation parks could be an effective tool for the solution of the R & D tasks formulated in the developmental policy for industry. There already exists in the R & D priorities of the Seventh 5-Year Plan, in energetics, electronics, biotechnology, automation of manufacturing and the progressive areas of the chemical industry, an intellectual base the exploitation of which could be multiplied by these new type institutions. I would like to emphasize that we do not want industry to create innovation boutiques. We will put the resources where there is suitable receptivity for longer range industrial development ideas. The goal is for R and D ideas and inventions born at various levels to become industrial products, to close the innovation chain more quickly. The ministry has cooperated in the organization of several innovation parks. The Innovation Parks Coordinating Council founded in August 1986 offers aid to those participating in concrete work.

[Question] The doubters usually do not dispute the goal but rather the frameworks. What sort of form does industry find optimal?

[Answer] They are not uniform. Industrial policy must take cognizance of the existing regional ideas and adapt to them. In both substantive and formal

questions we must build on local initiatives. What is most important is to discover and harmonize the interest relationships. Innovation parks are not enterprises but rather growths of an entrepreneurial nature where the players are researchers, teachers, institutions and banks--representing their own ideas and expectations. We must immediately say something here about expectations. The path of introducing technical development and research results is full of risk elements, and the return on investment is slow. So all those who expect an immediate profit are dissatisfied. We agree that a motivated performance constraint must be realized in the R & D process, but innovation also requires patience and trust! There are also debates now about the legal forms of a firm. All sorts of things come up from a loose undertaking which is not a legal entity to a joint stock company. Our position is that the operational frameworks must be chosen keeping in mind the interests of the given area, for the innovation park itself only offers a framework, a framework best suiting the interests, for the cooperation of industry and science. This matter should not be treated as a campaign; we must act with patience and foresight, and I warn everyone against expecting miracles. Today, in my opinion, we might talk rather about innovation islands which have the mission, in addition to realizing long-range goals, of developing an infrastructure for research and development in a university environment, gradually making Hungarian social and economic life innovation friendly.

Examples of Ministry Organized Projects

Budapest UJ IMPULZUS in Hungarian No 5, 7 Mar 87 p 10

[Text] The Szeged Innovation Park
The initial R & D nucleus was the Biotechnika joint stock company and the Biotechnology Industry Large Laboratory which is being built. The patron of the park is the JATE [Attila Jozsef Science University]. The professional themes are basically in areas of biotechnology industry and agricultural and human health applications, but this does not exclude the possibility that other sciences may join.

The BME Innovation Park
An agreement between the BME [Budapest Technical University], the Ministry of Industry and the OMFB [National Technical Development Committee] signed in May 1986 sets forth its goals. The stressed professional areas are use of microelectronics, measurement and control technology and machine industry manufacturing automation. The Technova Bank joint stock company is also participating in organizational preparation and in setting it up. The substantive and financial questions are tied to the G/6 program of the OKKFT [National Medium-Range Research and Development Plan]. They plan to set up a CAD/CAM system connected with the park.

The Veszprem Innovation Park
The participants are the members of the Veszprem Scientific Research-Development-Production Association, the patron is the VVE [Veszprem Chemical Industry University] and the cooperating bank is Innofinance. The professional area is R & D activity and associated laboratory scale production involving pharmaceutical and crop protection material fermentation techniques and

environmental protection procedures. Organizational preparations are now under way.

The Debrecen Innovation Park
On 31 October 1986 the KLTE [Lajos Kossuth Science University], MTA-ATOMKI [Nuclear Research Institute of the Hungarian Academy of Sciences], the Ministry of Industry, the Technova Bank and several industrial enterprises of the region (e.g., the Roller Bearing Works, Medicor, and the Tungsram joint stock company) signed an agreement concerning creation of an economic association which will not be a legal entity. The activity of the park will be related to the professional work of the Debrecen Physics Center, which is to be established. The preferred professional areas are applied physics, the instrument and machine industries and electronics.

The Borsod Innovation Park
Preparations for this are now under way through the Borsod County organization of the Creative Youth Association. The depositee of the park will be NME/Miskolc [Heavy Industry Technical University/Miskolc]. The anticipated professional areas will be the machine industry, metallurgy and the synthetics industry, with the cooperation of industrial enterprises in the county.

The Paks Innovation Center
This will be built on the professional-intellectual base which has developed in the region, primarily on the computerized system modeling activity of the Paks Nuclear Power Plant Enterprise and on the work of the Paks College School which will be created as part of the Budapest Technical University.

The ELTE [Lorand Eotvos Science University] has also taken an initiative to create an innovation park.

Description of BME Park

Budapest UJ IMPULZUS in Hungarian No 5, 7 Mar 87 p 11

[Interview with Dr Robert Tuschak, deputy rector of the Budapest Technical University, by Sz. P. Sz.: "A Working Reality"]

[Text] In 1986 the Ministry of Industry, the OMFB [National Technical Development Committee] and the BME [Budapest Technical University] signed an agreement which set down the conditions for the creation of the first innovation park in the capital. According to the thinking the new establishment will aid the problems of industry by developing microelectronic and mechatronic equipment. The BME offers a suitable intellectual background for this.

So the "system patron" will be the BME, and the chief organizer of the park is deputy rector Dr Robert Tuschak, leader of the automation faculty.

[Question] How far have the preparations gone so far? It is said of you that you are too cautious....

[Answer] All those from the university who are participating in this, including myself, would like it if the innovation park--which has become a slogan for us--were an operable reality. It may appear to be carping, but we

cannot get into such an undertaking without adequate preparation and thinking things through, because then the problems would appear subsequently.

It should be noted that the similar institutions created under Western conditions and operating well have the most modern equipment and infrastructure. All of them conduct some sort of basic research, but they do not sell the results of this directly but only through the students graduating from them or the instructors departing from them. This was one of the reasons for founding innovation parks. With their spontaneous creation the transfer process was accelerated and they provided an organizational framework and infrastructural background for making use of the results. In America the parks are not financed by the universities, they are not operated in order to provide extra income for the instructors, for they are not in need of it. The state and the banks provide the venture capital. The state does so in order to support and strengthen small undertakings and the creation of them--because recently only they have been creating jobs--and not least of all because a significant part of the tax income comes from these small undertakings.

What is the situation here? The BME itself takes care of about 50 percent of its own maintenance. The annual income from its commission research and development jobs is 600 million forints. Of this we pay 100 million to the state and another 100 million goes to research and material costs. We can dispose of the rest. We may applaud this brilliant achievement, but it is increasingly difficult to get this money--these jobs--and together with the other 600 million received from the state we just cover the operational costs of the university.

What has been said proves that we have some experience in the area of research and development, of innovation, because what we are doing now is a unique form of an innovation park. About 40 percent of the research done in institutions of higher learning is being done at the BME, and we put the results of this directly into industry! At the same time the equipment and infrastructure of the BME are limited and obsolete. We do not have a powerful computer system, we have no vacant premises and the instruments for the most modern technologies are missing. So our present situation is not an entirely suitable background for a new innovation park.

[Question] The state support offered for founding it might solve these problems. They are expecting the university to provide the intellectual background and spirit.

[Answer] That is precisely why we asked for a building and laboratory investment for setting up the park, an investment with which the missing elements could be filled in. Of course, there are other unclarified questions as well. In what form and under what economic conditions will the park operate? If we create it as an idependently managing legal entity then what economic regulations will apply to it? The Szeged example proves that without clarifying these questions there may arise insupportable burdens which make the entire undertaking uncertain. Nowhere are the parks organizations with a ccofit interest. They are incapable of producing a profit sufficient for capital repayment and large taxes--in addition to their own maintenance and development. According to international and our own experiences it takes about

3 years for a park to become self-supporting, and one cannot expect large scale profit generation from it even after that.

[Question] How do you imagine that the park should operate?

[Answer] We have agreed with our partners in many questions already. We have agreed that the park will be open, everyone can make use of its services under the same conditions. We have also agreed that investment is needed to make up the building and infrastructural deficiencies. We think that the Ministry of Industry and the OMFB should provide 280 million forints for this purpose. The BME will participate in the work with the land and its intellectual and material background. But it is essential that the mentioned infrastructural investment should not be regarded as a profit making activity from the viewpoint of taxation!

For the time being we are recommending an organizational form for the park which will operate under the patronage of the university; within this it will be an association with separate, independent accounting and without legal entity status. After a transitional period--about 3 years--the park must become self-supporting. Out of its receipts it must cover amortization and overhead costs, and the amortization must guarantee constant modernization. We do not consider repayment of the invested capital to be realistic--especially not proportional to the capital! One could imagine some repayment, proportional to turnover, but only after the undertaking is fully developed and only to the extent that it does not make the price of the products of the park unrealistically high. We are proposing that the founders not take out a profit or repayment but rather leave it in for renewal and development. Thus it could be guaranteed that the park will not later become a debit item for the founders.

The profit to the Ministry of Industry and the OMFB will appear indirectly in industrial innovation, and the profit to the university will appear in stepping up industry oriented research and later, perhaps, in a structural change in the present mechanism for industrial research.

In any case, this is the general practice even abroad; no one would even think of paying for the computer investment of a university out of the direct profit of a park, and the computer and other instrument prices there are lower by an order of magnitude.

We can cite a good example from here at home too. The innovation park of the Atomic Research Institute in Debrecen could be a model for the other domestic parks to be established. We also would like to found an organization similarly set up.

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SOVIET, SATELLITE DATA BASE NOTED

Budapest UJ IMPULZUS in Hungarian No 5, 7 Mar 87 p 16

[Unsigned article: "Automated International Information Exchange--Among Socialist Countries Too"]

[Text] The technological level and automation of production have reached a level at which the emphasis of human activity shifts in the direction of the data processing spheres of preparation for and control of production. Fewer and fewer deal with the transformation and transportation of materials and energy while more and more deal with the processing and transmitting of the information needed to prepare and control the above processes.

In the developed capitalist countries today almost half of those employed work in the area of information processing and transmission. At the same time information is becoming a significant factor in increasing productivity and is appearing more and more as a commodity itself. Computer networks are efficient tools for transporting the information commodity. More than 200 public computer networks now operate throughout the world, and many of these are connected with one another as well. This is essentially a global system of computer-computer links which unites the informatics and computer technology resources of the developed countries.

In recent years intensive work has been done in the Soviet Union and other socialist countries, here as well, in the area of computer networks, automated databanks and integrated use of them. Since 1982, with a commission from the Ministry of Industry, the Electric Power Industry Research Institute (VEIKI) has been cooperating with a Soviet research institute to access energetics data available in the Soviet Union--over a telecommunications channel.

The Research Institute for Applied Automated Systems (VNIIPASz) operating under the authority of the Soviet Scientific and Technical State Committee (GKNT) and the Soviet Academy of Sciences (SZUTA) offers a number of information services thanks to its links with a number of Soviet institutions and a few large Western data networks.

A direct link between the VEIKI and the VNIIPASz has been established, making possible simultaneous two-way information service. The databases of the Soviet institutions connected into the system can be queried from the terminal set up

in the VEIKI building through the switching system of the VNIIPASz, and users at these institutions also have access to the data stored in the VEIKI computer. Through the VEIKI one can contact the databases of three institutions in Moscow--the VINITI (Scientific-Technical Information Institute), the INION (the Social Sciences Information Institute of the SZUTA) and the MCNTI (International Scientific-Technical Information Center).

At present the system can be accessed only from the terminal located at the VEIKI. Serving other Hungarian users is only possible, naturally, if each of them can access the services of the system under conditions most favorable for them. This cannot be done under the present arrangement, so discussions have begun between the Hungarian Post Office and the VNIIPASz--with the cooperation of the VEIKI--about setting up a direct link between the packet center of the Hungarian Post Office, now in experimental operation, and the VNIIPASz so that Hungarian users can access the resources of the VNIIPASz through the domestic packet center.

An X. 75 link between the Hungarian Post Office and the VNIIPASz can be expected by the beginning of 1987 [as published]. With the aid of this the automated information exchange system of the CEMA countries will become accessible for any institution through the public telephone network or the line switched data network (NEDIX) of the Hungarian Post Office, but the links between the services and the users will be developed by the VEIKI.

Not Yet Packet Switched

Information exchange between the VNIIPASz and the majority of the owners of the Soviet databases is not yet realized in the packet switching mode. For the time being this, and the restricted through-put capability of the available connections, makes possible use of the services only according to a predetermined schedule, which, in practice, means that a user must report a week in advance on what days he wants to work with which databases and for how long (giving beginning and ending times with one minute precision). The switching system of the VNIIPASz stores the request and establishes the link between the user and the host required by him only at that time.

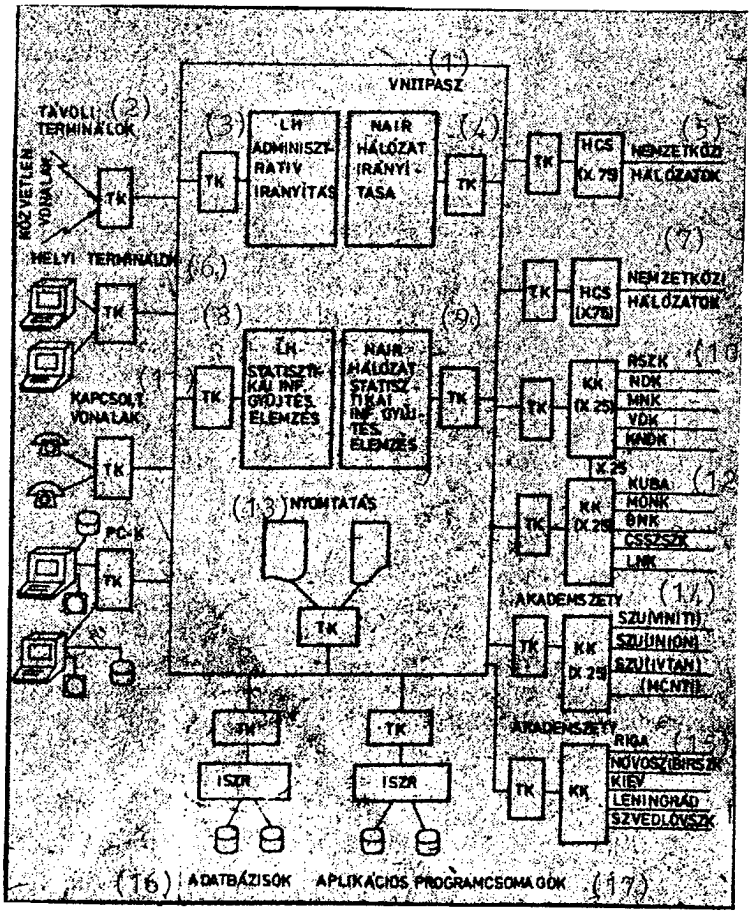
Creating a link in this way consists of the following steps--after the user has reached the switching system of the VNIIPASz:

a. Entry into the VNIIPASz switching system. This checks access authorization.

b. Requesting connection with the desired host. During this the switching system checks whether the host is available for the requesting user at the given time. If so it creates the link; if not it rejects the request.

c. Entry into the system of the host providing the service. Here the host checks the access authorization of the user.

This schema is valid in the case of hosts connected to VNIIPASz in the Soviet Union and in other socialist countries.



The Connections of the Soviet Information Exchange Center

Key:

1. The VNIIPASz
2. Remote terminals
3. IH administrative guidance
4. NAIR net control
5. International networks
6. Local terminals
7. International networks
8. IH statistical information collection and analysis
9. NAIR network statistical collection and analysis
10. Romanian Socialist Republic
    GDR
    Hungarian People's Republic
    Democratic Republic of Vietnam
    Democratic People's Republic of Korea
11. Switched lines
12. Cuba
    Mongolian People's Republic
    Bulgarian People's Republic
    Czechoslovak Socialist Rep.
    Polish People's Republic
13. Printing
14. Academy institutes
    VINITI
    INION
    IVTAN
    MCNTI
15. Academy institutes
    Riga
    Novosibirsk
    Kiev
    Leningrad
    Sverdlovsk
16. Databases
17. Applications program packages

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AVIBRAS SUBSIDIARIES' PARTICIPATION IN MISSILE PROJECTS VIEWED

Sao Paulo GAZETA MERCANTIL in Portuguese 27 Mar 87 Special Supplement p 5

[Text] New, large-sized special vehicles for handling cargo, new long-range military missiles, and a likely venture into the computer field are some of the current projects being developed by the companies of the Avibras group, founded 26 years ago in Sao Jose dos Campos (Sao Paulo). Specializing in the armament field, the group expects to bill about $261 million this year, 26.6 percent more than in 1986.

Pedro Angel Vial, aged 35, the group's official spokesman and director of one of its subsidiaries, Tectran Enginnering, Industry, and Commerce, Inc, reports: "We are developing a new family of surface-to-surface missiles, with a range of 300 kilometers, the SS-300, as well as surface-to-underwater, or underwater-to-underwater missiles, the Barracuda."

Those projects, initiated nearly 3 years ago, have already brought some concrete results in the components field. According to the executive, one of the group's minority associates, Avibras has already succeeded in developing a flight control inertial system for long-range missiles, identified by the initials SIS.

Vial explains: "This is a system for our own use that we are now also negotiating with friendly countries." The SIS, based on an assembly of "several gyroscopes," ensures that the missile will maintain the planned route, providing its internal computer, without interruption, the magnetic north location in relation to the missile's position.

Several Clients

The combination of that information with two other constant data, one vertical and the other horizontal, prevents the missile from deviating from the target; also allowing for changes in the route when necessary. He adds: "This system guides the missile during the sustainer flight, before its on board radar detects the target. Thereafter, the flight is guided by radar."

The SS-300 missile will be nearly 10 meters long by 1 meter in diameter; and can carry a warhead with almost 1 ton of explosives. It is expected that the missile will be able to operate in 1990.

In the case of the Barracuda, it is Avibras' intention to achieve a missile with a performance similar to that of the French Exocet, famous for its use in the Falklands War. Without giving any further details in this regard, Vial reports that the two families of missiles are being negotiated "with several clients," in addition to the Brazilian Navy and Army.

Vial comments: "In the near future, we intend to use our experience in military electronics and computers to develop civilian applications. This would be done through a new subsidiary, which has a great chance of being created." He ends, laconically, by saying: "One of our priorities is growth in that field."

Tectran, a company directed by Vial, was founded in 1982 especially to manufacture missile launchers of the Astros line, developed by Avibras Aerospace, Inc (the mother company) since 1981. This year, the group's expectation is that Tectran will bill nearly $20 million compared with $4 million in 1986.

Without Idleness

The executive explains: "In both instances, 90 percent of that billing is due to the Astros line," noting that Tectran's production capacity has already been "virtually taken up" for the present fiscal year. The remaining 10 percent relates to its civilian vehicles line, the first model of which (a self-propelled crane carriage on tires) was introduced in mid-1983.

According to the company's director, it is expected to expand further still the range of the firm's products, also including a "locotractor" for hauling railroad cars, a tractor with an elevator platform for pallets, and a jointed tractor for transporting iron and steel crucibles.

Tectran is Avibras' oldest subsidiary, and the one with the largest billing. In 1983, the company purchased control of another firm, Tectronic, now Powertronic, a manufacturer of trolley buses and electronic equipment. Its anticipated billing for this year is $9 million, compared with $1 million last year.

In 1986, the group created another affiliate: Usiforja, intended to render tooling and shaping services for the aerospace and automotive industries. Vial notes: "The idea (of the group) is to expand the markets already won, and to gain others. The idea is to make the subsidiaries carry out their respective missions independently of the Avibras purchases."

At present, Avibras Aerospace is by far the group's largest company, with billing of about $200 million last year, 90 percent originating from sales on the foreign market.

2909
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PRIVATE FIRMS' PARTICIPATION IN SATELLITE PROGRAM DISCUSSED

Sao Paulo GAZETA MERCANTIL in Portuguese 27 Mar 87 Special Supplement p 5

[Text] The national industry's participation in the construction of the Brazilian satellites, scheduled to be launched between the end of this decade and the beginning of the next, has started to materialize in the Brazilian Complete Space Mission (MECB).

This is a program the main goal of which is to put four satellites in orbit: two for data collection and two for remote sensing; to be constructed by the Institute of Space Research (INPE) at Sao Jose dos Campos (Sao Paulo). The development of the booster rocket will be incumbent on the Aerospace Technical Center (CTA), in the same city.

Already operating in the INPE area as suppliers of MECB are companies such as EMBRAER [Brazilian Aeronautics Company] and Bernardini, of Sao Paulo; while others, such as Hydrology Engineering and Qalab Electromagentic Protection, both of Rio de Janeiro, have signed contracts with the agency for transfer of technology, resulting from activities associated with the space program.

According to Marco Antonio Raupp, a 48-year old mathematician promoted to the position of INPE director in April 1985, starting with the next phase of the program (the construction of the remote sensing satellites), a virtually complete involvement of the industry has been planned. "By then, INPE will already have mastered the technologies necessary for the program's development; and then the manufacturing process can be turned over to the companies." At that time, the agency would only deal with the tasks involving specification and integration of the systems.

Transfer

He stressed that the structure for the first satellite to be built, the data collecting one, to be launched about February 1989, is being assembled by EMBRAER. It involves a beehive type panel (consisting of hexagonal plates), which uses an aluminum alloy that is simultaneously light and sturdy. That framework will support an assembly consisting of antennas and various electronic components, and must be capable of withstanding the acceleration of the booster rocket until the satellite's entry into orbit.

Paulo Tromboni de Souza Nascimento, INPE's manager of technological dissemination and industrial policy, explains that the Bernardini firm will be responsible for the work to manufacture the spool coil and the nutation shock absorbers, which are part of the system that keeps the satellite stabilized in space, diminishing movements that could dislocate it from its proper position.

INPE is also now transferring to the national companies technologies developed on the basis of MECB. Souza Nascimento relates that, this month, a contract was signed with Qalab, of Rio de Janeiro, which will train the firm to manufacture an armored chamber, part of a protective assembly against electromagnetic interference, built at the institute to make tests on satellite equipment and systems.

Automatic Systems

The armored chamber (which is a modular room with metal walls) requires a construction and assembly technology unprecedented in the country to date, reveals Benjamim Correa Galvao, from the integration and test department. It is possible to test in it, for example, computers, and laboratories for calibrating electrical magnitudes and sophisticated hospital equipment, which cannot undergo electromagnetic interference without detriment to their performance.

Another development in the transfer of technology phase relates to the data collection platforms (DCP) of the Argos and Goes type, which the agency built based on its participation since the 1970's in activities associated with the reception of data from atmospheric satellites.

These are small automatic stations provided with sensors such as those for pressure, temperature, and humidity, whose parameters are sent to the satellites and from there retransmitted to the INPE receiver station, set up in Cachoeira Paulista (Sao Paulo).

The process for the manufacture of the Argos/DCP (for low-altitude satellites), which are of particular interest to firms that are electricity concession-holders, is being turned over to the Hydrology Engineering firm in Rio, which will most likely begin their construction this year.

According to Souza Nascimento, out of a total of 124 projects under development at INPE, which have been analyzed by its management, 38 were considered promising from the standpoint of transfer of technology. Included among them is the one for infravoltaic detectors for infrared, with applications in quality control of industrial processes and also in the medical field, as a diagnostic aid; as well as a process for the preparation of anhydrous hydrazine, to be used in the plastics industry.

Included among the projects identified as capable of training suppliers for MECB is that for solar cells with spatial qualifications, and also that for a digital sensor, a device which measures the satellite's position in relation to the sun, and aids in the determination of its attitude.
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END